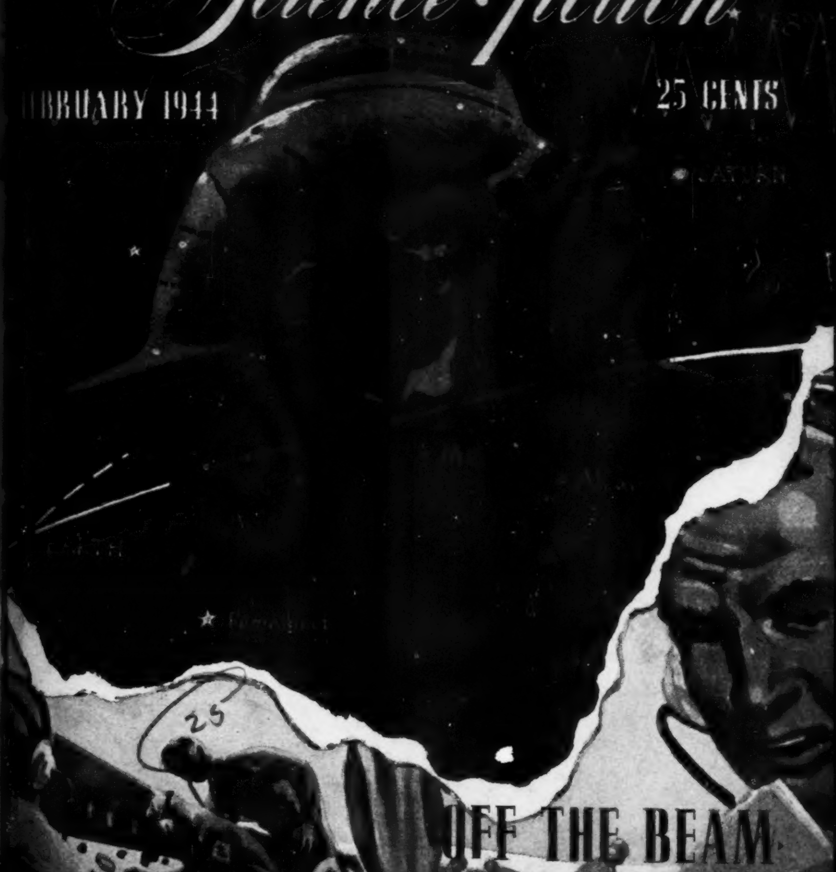
A STREET & SMITH PUBLICATION

ASTOUNDING

Science-Fiction

EBRUARY 1944

25 CENTS


SATURN
EARTH

25

OFF THE BEAM

Wouldn't you like a SHAVING CREAM

Guaranteed not to "solve your shaving problem"?

Plain facts for black-bearded men who have discovered that miracles do not come in tubes

If you are the kind of person who really has a "shaving problem"—Brother, you had better see a psychoanalyst.

Our Listerine Shaving Cream is for men with adult minds as well as grown-up whiskers; for men intelligent enough . . . or disillusioned enough . . . not to expect that any soap, cream, lotion, or salve, will make shaving a pleasure.

We say for Listerine Shaving Cream that it is a *sensible* shaving aid. Just a little of it, a fraction of an inch, makes great billows of moisture-laden lather. This helps it wilt wiry whiskers and reduce the sting and nuisance of shaving.

Men with tough beards and tender skins, who have tried it, say that it really gets the razor over the rough spots when they're plowing under their daily crop of bristle.

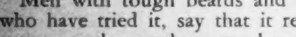
We promise that this quality shaving cream will help you give yourself a whacking good shave. If this plain, unadorned promise appeals to you, you're just the man who ought to meet Listerine Shaving Cream face to face. Ask for it at any drug counter. The price is low, the tube lasts long; so it is just as smart to buy as it is smartless to use.

Lambert Pharmacal Co.,
St. Louis, Mo.

In every way worthy of the
because made to the Listerine
standard of quality
LISTERINE
SHAVING CREAM

THE 35¢ TUBE THAT LASTS AND L-A-S-

month after month after mont



REMEMBER, THERE ARE 2 TYPES OF LISTERINE SHAVING

Out of this tube come swell shave

MAKE YOUR RESERVATION FOR A PLACE AMONG THE LEADERS IN THE COMING VICTORY ERA OF MIGHTY INDUSTRIAL-COMMERCIAL GROWTH & DEVELOPMENT-JUST MAIL THE COUPON!

INTERNATIONAL CORRESPONDENCE SCHOOLS

SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES ★

BOX 4905-P, SCRANTON 9, PENNA.

Without cost or obligation, please send me a copy of booklet and full particulars about the course *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Air Brake
☐ Air Conditioning
☐ Airplane Drafting
☐ Architectural Drafting
☐ Architecture
☐ Aviation
☐ Aviation Mechanic
☐ Blueprint Reading
☐ Boilermaking
☐ Bridge Engineering
☐ Chemistry
☐ Civil Engineering
☐ Coal Mining
☐ Concrete Engineering
☐ Contracting and Building
☐ Diesel Engines
☐ Electrical Drafting
☐ Electrical Engineering
☐ Electrician
☐ Electrical Maintenance
☐ Foundryman ☐ Heating
☐ Heat Treatment of Metals
☐ Highway Engineering
☐ Industrial Metallurgy
☐ Locomotive Engineer
☐ Machinist ☐ Inspector
☐ Marine Engines
☐ Mechanical Drafting
☐ Mechanical Engineering
☐ Mine Foreman
☐ Mold-loft Work
☐ Navigation ☐ Plastics
☐ Patternmaking
☐ Pulp and Paper Making
☐ Radio Operating
☐ Radio Servicing
☐ R. R. Section Foreman
☐ R. R. Signalman
☐ Refrigeration
☐ Sanitary Engineering
☐ Sheet Metal
☐ Ship Drafting
☐ Shipfitting
☐ Shop Practice
☐ Steam Electric
☐ Steam Engines
☐ Steam Fitting
☐ Structural Drafting
☐ Structural Engineering
☐ Surveying and Mapping
☐ Telegraphy ☐ Telephony
☐ Tool Design ☐ Welding

BUSINESS COURSES

☐ Accounting
☐ Advertising
☐ Bookkeeping
☐ Business Correspondence
☐ Business Management
☐ Civil Service
☐ College Preparatory
☐ Commercial
☐ Cost Accounting
☐ C. P. Accounting
☐ First Year College
☐ Foremanship ☐ French
☐ Good English
☐ High School
☐ Managing Men at Work
☐ Railway Postal Clerk
☐ Salesmanship
☐ Secretarial
☐ Spanish
☐ Tax Accountant

HOME ECONOMICS COURSES

☐ Advanced Dressmaking
☐ Foods and Cookery
☐ Home Dressmaking
☐ Professional Dressmaking and Designing
☐ Tea Room and Cafeteria Management, Catering

Name..*Age*..............*Home Address*..

City..*State*..............................*Present Position*..

Canadian residents send coupon to International Correspondence Schools Canadian, Limited, Montreal, Canada.
British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England.

AST.—1B

Editor
JOHN W. CAMPBELL, JR.

ASTOUNDING
SCIENCE FICTION

Reg. U. S. Pat. Off.

CONTENTS

FEBRUARY, 1944 VOL. XXXII, NO. 6

NOVELETTES

OFF THE BEAM, *by George O. Smith* 6
PLAGUE, *by Murray Leinster* 52
THE ANARCH, *by Malcolm Jameson* 123

SHORT STORIES

THOUGH DREAMERS DIE, *by Lester del Rey* . 34
TABOO, *by Fritz Leiber, Jr.* 85
CATCH THAT RABBIT, *by Isaac Asimov* . . . 159

ARTICLES

UNIVERSES TO ORDER, *by J. J. Coupling* . . 102
THE PLURALITY OF WORLDS, *by Willy Ley* 112

READERS' DEPARTMENTS

THE EDITOR'S PAGE 5
IN TIMES TO COME 83
BRASS TACKS 95
THE ANALYTICAL LABORATORY 178

COVER BY TIMMINS
Illustrations by Orban, Smith and Williams

The editorial contents have not been published before, are protected by copyright and cannot be reprinted without publisher's permission. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental.

Monthly publication issued by Street & Smith Publications, Incorporated, 122 East 42nd Street, New York 17, N. Y. Allen L. Grammer, President; Gerald H. Smith, Vice President and Treasurer; Henry W. Ralston, Vice President and Secretary. Copyright, 1944, in U. S. A. and Great Britain by Street & Smith Publications, Inc. Reentered as Second-class Matter, February 7, 1938, at the Post Office at New York, under Act of Congress of March 3, 1879. Subscriptions to Countries in Pan American Union, $2.75 per year; elsewhere, $3.25 per year. We cannot accept responsibility for unsolicited manuscripts or artwork. Any material submitted must include return postage.

$2.50 per Year in U. S. A. Printed in the U. S. A. **25¢ per Copy**

NEXT ISSUE ON SALE FEBRUARY 11, 1944

Practically Nothing

"Practically nothing is as expensive as practically nothing" is a nice, cockeyed-sounding way of stating that a near vacuum is an expensive industrial raw material. And, of course, like any other commodity, the nearer it approaches 100% purity, the nearer the cost approaches infinity, particularly when you want to work in that medium.

Consider the process of developing a new electronic tube. In this issue we carry an article on the design of electron multipliers, and of many electronic devices other than multipliers too, for that matter—the principle involved is fairly general. The theory is nice, and works well where secondary electrons are wanted, are the prime consideration. But in most vacuum tube amplifiers secondary electrons are simply static in the works—everything possible is done to suppress them. But they still show up, and they make for troubles not easily predictable on the basis of rubber sheets and shaped supports. The number of secondary electrons, and the consequent behavior of the tube, can be determined only by trying out actual tube elements in a properly evacuated tube.

But this properly evacuated tube consists of a glass or metal envelope, with the proposed electrodes mounted in place, and then subjected to a highly complex technique of evacuation. First, the loose gases must be pumped out to a hard vacuum. Then the envelope and inclosed electrodes must be degassed; all metals, all solids, soak up gas as a brick soaks up water, and to get that trapped gas out the material must be heated while the high-vacuum system pumps steadily. Proper, complete degassing takes time—a goodly number of hours. Usually a good bit of this can be skipped in test equipment, and the use of a chemical "getter"—a bit of metallic magnesium that will combine avidly with any of the ordinary gases to form solid compounds, perhaps—saves time and does a final clean-up job. Then the new tube is ready for testing.

And perhaps half an hour of testing reveals that the electrode structure is wrong—this one should be shifted *here*. That, of course, is impossible; a new tube is made, degassed, and tested. Hm-m-m—now the interaction is such that this other one should be over this way—

In a laboratory established on the Moon, perhaps well up near the top of the crater walls of Tycho, to get above the lingering traces of lunar atmosphere, the laboratory worker, clad in an air-suit, could simply push the electrodes around in their completely degassed, but completely accessible environment of hard vacuum. A smaller body than the Moon would perhaps give a harder vacuum, but the presence of a gravitational field is helpful—men can work more efficiently.

There's a lot of chemical research, too, that needs a cheap, hard vacuum. Almost any organic substance is volatile in some degree before it breaks down—but usually the degree of volatility is so slight that only in a very hard vacuum can such sublimation be carried out.

Whether chemist, physicist, or atomic researcher, any researcher would be immeasurably aided by a "vacuum pump" that could sweep the pressure down to practically nothing through a 36" vacuum main! It would require him to redesign his whole technique of operation—and he'd love it. It would mean as much to organic chemistry, I suspect, as the development of microchemical analysis did.

Unlimited hard vacuum awaits, closer to New York than Melbourne is, but in the opposite direction. Melbourne's a lot nearer these days—airplanes changed things. And there are rocket-assisted airplanes now that may shorten the distance the other way—

THE EDITOR.

Off the Beam

by GEORGE O. SMITH

Illustrated by Orban

***Communication** from ship to planet was a nice intellectual problem for Don Channing—till he was on the wrecked ship that had to call for help!*

Thirty hours out of Mars for Terra, the *Solar Queen* sped along her silent, invisible course. No longer was she completely severed from all connection with the planets of the inner system; the trick cams that controlled the beams at Venus Equilateral kept the ship centered by sheer mathematics. It was a poor communications system, however, since it was but a one-way job. Any message-answering would have to be done thirty hours later when the ship made planetfall, and the regular terminal office of Interplanetary Communications could be employed.

In spite of her thirty hours at

2-G, which brought her velocity to eleven hundred miles per second, the beam-director cams did their job well enough. It was only in extreme cases of course-changing to dodge meteors that the beams lost the ship; since the cams were not clairvoyant, there was no way to know when the autopilot juggled the controls to miss a bit of cosmic dust. The cams continued to spear the space through which the ship was supposed to pass according to the course constants.

What made this trip ironic was the fact that Don Channing was aboard. The beams had been bombarding the *Solar Queen* continually ever since she left Mars with messages for the Director of Communications. In one sense, it seemed funny that Channing was for once on the end of a communications line where people could talk to him but upon which he could not talk back. On the other hand it was a blessing in disguise, for the Director of Communications was beginning to paper-talk himself into some means of contacting the Relay Station from a spaceship.

A steward found Channing in the salon and handed him a 'gram. Channing smiled, and the steward returned the smile and added: "You'll fix these ships to talk back one day. Wait until you read that one—you'll burn from here to Terra!"

"Reading my mail?" asked Channing cheerfully. The average spacegram was about as secret as a postcard, so Channing didn't mind. He turned the page over and read:

HOPE YOU'RE WELL FILLED WITH GRAVANOL AND ADHESIVE TAPE FOR YOUR JUMP FROM TERRA TO STATION. SHALL TAKE GREAT DELIGHT IN RIPPING ADHESIVE TAPE OFF YOUR MEASLY BODY. LOVE.
ARDEN

"She will, too," grinned Don. "Well, I'd like to toss her one back, but she's got me there. I'll just fortify myself at the bar and think up a few choice ones for when we hit Mojave."

"Some day you'll be able to answer those," promised the steward. "Mind telling me why it's so tough?"

"Not at all," smiled Channing. "The problem is about the same as encountered by the old-time cowboy. It's a lot easier to hit a man on a moving horse from a nice, solid rock than it is to hit a man on a nice, solid rock from a moving horse. Venus Equilateral is quite solid as things go. But a spaceship's course is fierce. We're wabbling a few milliseconds here and a few there, and by the time you use that arc to swing a line of a hundred million miles, you're squirting quite a bit of sky. We're tinkering with it right now, but so far we have come up with nothing. Ah, well, since the human race got along without electric lights for a few million years, we can afford to tinker with an idea for a few months. Nobody is losing lives or sleep because we can't talk to the boys back home."

"We've been hopping from planet to planet for quite a number of years too," said the steward. "Quite a lot of them went by before it was even possible to contact a ship in space."

"And that was done because of an emergency. Probably this other thing will go on until we hit an emergency; then we shall prove that old statement about a loaf of bread being the maternal parent of a locomotive." Channing lit a cigarette, and puffed deeply. "Where do we stand?"

"Thirty hours out," answered the steward. "About ready for turnover. I imagine that the poor engineer's gang is changing cathodes about now."

"It's a long drag," said Channing. He addressed himself to his glass and began to think of a suitable answer for his wife's latest thrust.

Bill Hadley, of the power engineer's gang, spoke to the pilot's greenhouse below the ship. "Hadley to pilot room: Cathodes 1 and 3 ready."

"Pilot Greenland to Engineer Hadley: Power fade-over from even to odd now under way. Tubes 2 and 4 now dead; load on 1 and 3. You may enter 2 and 4."

"Check!"

Hadley cracked an air valve beside a circular air door. The hiss of entering air crescendoed and died, and then Hadley cracked the door that opened in upon the huge driver tube. With casual disregard for the annular electrodes that filled the tube and the sudden death that would come if the pilot sent the driving voltages surging into the electrodes, Hadley climbed to the top of the tube and used a spanner to remove four huge bolts. A handy differential pulley permitted him to lower the near-exhausted cathode from the girders to the air door where it was hauled to the deck. A fresh cathode was slung to the pulley and hoisted to place. Hadley bolted it tight and clambered back into the ship. He closed the air door and the valve, and then opened the valve that led from the tube to outer space. The tube evacuated and Hadley spoke once more to the pilot room.

"Hadley to Greenland: Tube 4 ready."

"Check."

The operation was repeated on Tube 2, and then Pilot Greenland said: "Fade-back beginning. Power diminishing on 1 and 3, increasing on 2 and 4. Power equalized, acceleration 2-G as before. Deviation from norm: two-tenths G."

Hadley grinned at the crew. "You'd think that Greenland did all that himself, the way he talks. If it weren't for autopilots, we'd have been all over the sky."

Tom Bennington laughed. He was an old-timer, and he said in a reminiscent tone: "I remember when we used to do that on manual. There were as many cases of *mal de void* during cathode change as during turnover. Autopilots are the nuts—look! We're about to swing right now, and I'll bet a fiver that the folks below won't know a thing about it."

A coincidence of mammoth proportions occurred at precisely that instant. It was a probability that made the chance of drawing a royal flush look like the chances of tomorrow coming on time. It was, in fact, one of those things that they said couldn't possibly happen, which went to prove only how wrong they were. It hadn't happened yet and probably wouldn't happen again for a million million years, but it did happen once.

Turnover was about to start. A relay circuit that coupled the meteor-spotter to the autopilot froze for a bare instant, and the coincidence happened between the freezing of the relay contacts and the closing of another relay whose purpose it was to shunt the coupler circuits through another line in case of relay failure. In the inconceivable short time between the failure and the device that corrected failure, the *Solar Queen* hit a meteor head on.

It is of such coincidences that great tragedies and great victories are born.

The meteor, a small one as cosmic objects go, passed in through the broad observation dome at the top of the ship. Unhampered, it zipped through the central well of the *Solar Queen* and passed out through the pilot's greenhouse at the bottom of the ship. Its speed was nothing worth noting; a scant twenty miles per second almost sunward. But the eleven hundred miles per second of the *Solar Queen* made the passage of the meteor through the six hundred feet of the ship's length of less duration than the fastest camera shutter.

In those microseconds, the meteor did much damage.

It passed through the main pilot-room cable and scrambled those circuits which it did not break entirely. It tore the elevator system from its moorings. It entered as a small hole in the observation dome and left taking the entire pilot's greenhouse and all of the complex paraphernalia with it.

The lines to the driver tubes were scrambled, and the ship shuddered and drove forward at 10-G. An inertia switch tried to function, but the resetting solenoid had become shorted across the main battery and the weight could not drop.

Air doors clanged shut, closing the central well from the rest of the ship and effectively sealing the well from the crew.

The lights in the ship flickered and died. The cable's shorted lines grew hot and fire crept along its length and threatened the continuity. The heat opened fire-quenching vents and a cloud of CO_2 emerged together with some of the liquid gas itself. The gas quenched the fire and the cold liquid cooled the cable. Fuses blew in the shorted circuits—

And the *Solar Queen* continued to plunge on and on at 10-G; the maximum possible out of her driving system.

The only man who remained aware of himself aboard the *Solar Queen* was the man who was filled with gravanol and adhesive tape. No other person expected to be hammered down by high acceleration. Only Channing, who was planning to leave Terra in his own little scooter, was prepared to withstand high G. He, with his characteristic hate of doing anything slowly, was ready to make the Terra to Venus Equilateral passage at 5- or 6-G.

It might as well have caught him, too. With all of the rest unconscious, hurt, or dead, he was alone and firmly fastened to the floor of the salon under eighteen hundred pounds of his own, helpless weight.

And as the hours passed, the *Solar Queen* was driving farther and farther from the imaginary spot that was the focus of the communicator beams from Venus Equilateral.

The newly-replaced cathodes in the driving tubes were capable of driving the ship for about two hundred G-hours at 1-G, before exhaustion to the point of necessary replacement for safety purposes. The proportion is not linear, nor is it a square-law, but roughly it lies in the region just above linear, so that the *Solar Queen* drove on and on through space for ten hours at 10-G before the cathodes died for want of emitting surface. They died, not at once, but in irregular succession so that when the last erg of power was gone from the ship it was zooming on a straight line tangent from its point of collision but rolling in a wild gyration through the void.

And twenty-five hundred miles per second added to her initial velocity of eleven hundred miles per second added up to thirty-six hundred miles per second. She should have had about seventy-five million miles to go at 2-G, to reach Terra in thirty hours from the halfway point where she turned ends to go into deceleration. Instead, the *Solar Queen* after ten hours of misdirected 10-G acceleration was thirty million miles on her way, or about halfway to Terra. Three hours later, driving free, the *Solar Queen* was passing Terra, having missed the planet by a few million miles.

Back in space, at an imaginary junction between the beams from Venus Equilateral and the course registered for the *Solar Queen,* Arden Channing's latest message was indicating all sorts of mild punishment for her husband when she got him home.

By the time that the *Solar Queen* should have been dropping out of the sky at Mojave Spaceport, the ship would be one hundred and ninety million miles beyond Terra and flirting with the imaginary line that marked the orbit of Mars.

That would be in seventeen hours.

Weightless, Channing pursued a crazy course in the salon of the spinning ship. He ached all over from the pressure, but the gravanol had kept his head clear and the adhesive tape had kept his body intact. He squirmed around in the dimness and could see the inert figures of the rest of the people who had occupied the salon at the time of the mishap. He became sick. Violence was not a part of Channing's nature—at least he confined his violence to those against whom he required defense. But he knew that many of those people who pursued aimless orbits in the midair of the salon with him would never set foot on solidness again.

He wondered how many broken bones there were among those who had lived through the ordeal. He wondered if the medical staff of one doctor and two nurses could cope with it.

Then he wondered what difference it made if they were to go on and on, and from that thought came the one he should have thought of first: How were they to stop going on and on? Channing had a rough idea of what had happened. He knew something about the conditions under which they had been traveling, how long, and in which direction. It staggered him, the figures he calculated in his mind. It behooved him to do something.

He bumped an inert figure, and grabbed. One hand took the back of the head and came away wet and sticky. Channing retched, and then threw the inert man from him. He coasted back against a wall, and caught a handrail. Hand-over-hand he went to the door and into the hall. Down the hall he went to the passengers' elevator shaft and with no thought of what his action would have been on any planet, Channing opened the door and drove down the shaft for several decks. He emerged and headed for the sick ward.

He found the doctor clinging to his operating table with his knees and applying a bandage to one of his nurses' heads.

"Hello, Doc," said Channing. "Help?"

"Grab Jen's feet and hold her down," snapped the doctor.

"Bad?" asked Don as he caught the flailing feet.

"Seven stitches, no fracture," said the doctor.

"How's the other one?"

"Unconscious, but unharmed. Both asleep in bed, thank God. So was I. Where were—? You're Channing and were all doped up with gravanol and adhesive. Thank yourself a god for that, too. I'm going to need both of my nurses and we'll all need you."

"Hope I can do some good," said Don.

"You'd better. Or any good I can do will be wasted. Better start right now. Here," the doctor produced a set of keys, "these will unlock anything in the ship but the purser's safe. You'll need 'em. Now get along and do something and leave the body-mending to me. Scram!"

"Can you make out all right?"

"As best I can. But you're

needed to get us help. If you can't, no man in the Solar System can. You're in the position of a man who can not afford to help in succoring the wounded and dying. It'll be tough, but there it is. Get cutting. And for Heaven's sake, get us two things: Light and a floor. I couldn't do more than slap on tape whilst floating in air. See you later, Channing, and good luck."

The nurse squirmed, groaned, and opened her eyes. "What happened?" she asked, blinking into the doctor's flashlight.

"Tell you later, Jen. Get Fern out of her coma in the ward and then we'll map out a plan. Channing, get out of here!"

Channing got after borrowing a spare flashlight from the doctor.

He found Hadley up in the instrument room with a half dozen of his men. They were a mass of minor and major cuts and injuries, and were working under a single incandescent lamp that had been wired to the battery direct by means of spare cable. The wire went snaking through the air in a foolish, crooked line, suspended on nothing. Hadley's gang were applying first aid to one another and cursing the lack of gravity.

"Help?" said Channing.

"Need it or offer it?" asked Hadley with a smile.

"Offer it. You'll need it."

"You can say that again—and then pitch in. You're Channing, of Communications, aren't you? We're going to have a mad scramble on the main circuits of this tub before we can unwind it. I don't think there's an instrument working in the whole ship."

"You can't unravel the whole works, can you?"

"Won't try. About all we can do is replace the lighting system and hang the dead cathodes in again. They'll be all right to take us out of this cockeyed skew-curve and probably will last long enough to keep a half-G floor under us for tinkering, for maybe forty or fifty hours. Assistant Pilot Darlange will have to learn how to run a ship by the seat of his pants—as far as I can guess there isn't even a splinter of glass left in the pilot room—so he'll have to correct this flight by feel and by using a haywire panel."

"Darlange is a school-pilot," grinned one of Hadley's men.

"I know, Jimmy, but I've seen him work on a bum autopilot, and he can handle haywire all right. It'll be tough without Greenland, but Greenland—" Hadley let the sentence fall; there was no need to mention the fact that Greenland was probably back there with the rest of the wreckage torn from the *Solar Queen*.

Jimmy nodded, and the action shook him from his position. He grabbed at a roll of tape that was floating near him and let it go with a laugh as he realized it was too light to do him any good.

"Too bad that this gyration is not enough to make a decent gravity at the ends, at least," snorted Hadley. He hooked Jimmy by an arm and hauled the man back to a place beside him. "Now look," he said, "I can't possibly guess how many people are still in working condition after this. Aside from our taped and doped friend here, the only ones I have are we who were snoozing in our beds when the crush came. I'll bet a cooky that the rest of the crowd are all nursing busted ribs, and worse. Lucky that full G died slowly as the cathodes went out; otherwise we'd all have been tossed against the ceilings with bad effects.

"Jimmy, you're a committee of one to roam the crate and make a list of everyone who is still in the running and those who can be given minor repairs to make them fit for limited work. Doc has a pretty good supply of Stader splints; inform him that these are only to be used on men who can be useful with them. The rest will have to take to plaster casts and the old-fashioned kind of fracture-support.

"Pete, you get to the executive deck and tell Captain Johannson that we're on the job and about to make with repairs. As power engineer, I've control of the maintenance gang too, and we'll collect the whole, hale, and hearty of Michaels' crew on our merry way.

"Tom, take three of your men and begin to unravel the mess with an eye toward getting us lights.

"Tony, you can do this alone since we have no weight. You get the stale cathodes from the supply hold and hang 'em back in the tubes.

"Channing, until we get a stable place, you couldn't do a thing about trying to get help, so I suggest that you pitch in with Bennington, there, and help unscramble the wiring. You're a circuit man, and though power-line stuff is not your forte, you'll find that running a lighting circuit is a lot easier than neutralizing a microwave transmitter. Once we get light, you can help us haywire a control panel. Right?"

"Right. And as far as contacting the folks back home goes, we couldn't do a darned thing until the time comes when we should be dropping in on Mojave. They won't be looking for anything from us until we're reported missing; then I imagine that Walt Franks will have everything from a spinthariscope to a gold-foil electroscope set up. Right now I'm stumped, but we have seventeen hours before we can start hoping to be detected. Tom, where do we begin?"

Bennington smiled inwardly. To have Don Channing asking him for orders was like having Captain Johannson request the batteryman's permission to change course. "If you can find and remove the place where the shorted line is, and then splice the lighting circuits again, we'll have a big hunk of our work done. The rest of us will begin to take lines off of the pilot's circuits right here in the instrument room so that our jury-controls can be hooked in. You'll need a suit, I think, because I'll bet a hat that the shorted line is in the well."

For the next five hours, the instrument room became a beehive of activity. Men began coming in driblets, and were put to work as they came. The weightlessness gave quite a bit of trouble; had the instrument panels been electrically hot, it would have been downright dangerous since it was impossible to do any kind of work without periodically coming against bare connections. Tools floated around the room in profusion, and finally Hadley appointed one man to do nothing but roam the place to retrieve "dropped" tools. The soldering operations were particularly vicious, since the instinctive act of flinging excess solder from the tip of an iron made droplets of hot solder go zipping around the room to splash against something, after which the splashes would continue to float.

Men who came in seeking to give aid were handed tools and told to do this or that, and the problem of explaining how to free a frozen relay to unskilled help was terrific.

Then at the end of five hours, Channing came floating in to the instrument room. He flipped off the helmet and said to Hadley: "Make with the main switch. I think I've got it."

Throughout the ship the lights blinked on.

With the coming of light, there came hope also. Men took a figurative hitch in their belts and went to work with renewed vigor. It seemed as though everything came to a head at about this time, too. Hadley informed Darlange that his jury-control was rigged and ready for action, and about the same time, the galley crew came in with slender-necked bottles of coffee and rolls.

"It was a job, making coffee," grinned the steward. "The darned stuff wanted to get out of the can and go roaming all over the place. There isn't a one of us that hasn't got a hot coffee scar on us somewhere. Now if he"—nodding at Darlange—"can get this thing straightened out, we'll have a real dinner."

"Hear that, Al? All that stands between us and dinner is you. Make with the ship-straightening. Then we'll all sit around and wait for Channing to think."

"Is the ship's communicator in working order?" asked Darlange.

"Sure. That went on with the lights."

Darlange called for everyone in the ship to hold himself down, and then he tied his belt to the frame in front of the haywired panel. He opened the power on drivers 1 and 2, and the ship's floor surged ever so little.

"How're you going to know?" asked Hadley.

"I've got one eye on the gyrocompass," said Darlange. "When it stops turning, we're going straight. Then all we have to do is to set our bottom end along the line of flight and pack on the decel. Might as well do it that way since every MPS we can lose is to our advantage."

He snapped switches that added power to Driver 3. Gradually the gyro-compass changed from a complex rotation-progression to a simpler pattern, and eventually the simple pattern died, leaving but one freedom of rotation. "I'm sort of stumped," grinned Darlange. "We're now hopping along, but rotating on our long axis. How we stop axial rotation with drivers set parallel to that axis I'll never guess."

"Is there a lifeship in working order?" asked Hadley.

"Sure."

"Tom, turn it against the rotation and apply the drivers on that until we tell you to stop."

An hour later the ship had ceased to turn. Then Darlange jockeyed the big ship around so that the bottom was along the line of flight. Then he set the power for a half-G, and everyone relaxed.

Ten minutes later Captain Johannson came in.

"You've done a fine job," he told Hadley. "And now I declare an hour off for dinner. Dr. MacLain has got a working medical center with the aid a few people who understand how such things work, and the percentage of broken bones, though terrific in number, is being taken care of. The passengers were pretty restive at first, but the coming of light seemed to work wonders. This first glimmer of power is another. About nine or ten who were able to do so were having severe cases of skysickness." He smiled ruefully. "I'm not too sure that I like no-weight myself."

"Have you been in the observation dome?" asked Don.

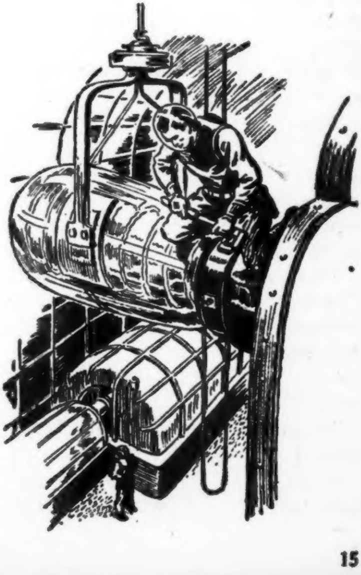
"Yes. It's pierced, you know."

"Did the meteor hit the telescope?"

"No, why?"

"Because I'm going to have to get a sight on Venus Equilateral before we can do anything. We'll have to beam them something, but I don't know what right now."

"Can we discuss that over a dinner?" asked the captain. "I'm starved, and I think that the rest of this gang is also."



"You're a man after my own heart," laughed Channing. "The bunch out at the Station wouldn't believe me if I claimed to have done anything without drawing it up on a tablecloth."

"Now," said Channing over his coffee. "What have we in the way of electronic equipment?"

"One X-ray machine, a standard set of communicating equipment, one beam receiver with 'type machine for collecting stuff from your Station, and so on."

"You wouldn't have a betatron in the place somewhere?" asked Don hopefully.

"Nope. Could we make one?"

"Sure. Have you got about ten pounds of No. 18 wire?"

"No."

"Then we can't."

"Couldn't you use a driver? Isn't that some kind of beam?"

"Some kind," admitted Channing. "But it emits something that we've never been able to detect except in an atmosphere where it ionizes the air into a dull red glow."

"You should have been wrecked on the *Sorcerer's Apprentice,"* laughed Hadley. "They're the guys who have all that kind of stuff."

"Have they?" asked Johannson.

"The last time I heard, they were using a large hunk of their upper hull for a VanDerGraf generator."

"That would do it," said Channing thoughtfully. "But I don't think I'd know how to modulate a VanDerGraf. A betatron would be the thing. You can modulate that, sort of, by keying the input. She'd give out with hundred-and-fifty-cycle stuff, but so what? We made the *Empress of Kolain* sit up and say uncle on hundred-cycle stuff. How much of a trick is it to clear the observation dome from the top?"

"What do you intend to do?"

"Well, we've got a long, hollow tube in this ship. Knock out the faceted dome above, and we can rig us up a huge electron gun. We'll turn the ship to point at the Station and beam 'em a bouquet of electrons."

"How're you going to do that?"

"Not too tough, I don't think. Down here," and Channing began to trace on the tablecloth, "we'll put us a hot cathode. About this level we'll hang the first anode, and at this level we'll put the second anode. Here'll be an acceleration electrode, and up near the top we'll put a series of focusing anodes. We'll tap in to the driver-tube supply and take off voltages to suit us. Might use a tube at that, but the conversion to make an honest electron gun out of it would disrupt our power, and then it would be impossible to make a driver out of it again without recourse to a machine shop."

"How are you going to make electrodes?"

"We'll use the annular gratings that run around the central well at each level," said Channing. "We'll have a crew of men cut 'em free and insulate the resulting rings with something. Got anything?"

"There is a shipment of methylmethacrylate rods for the Venus Power Co. in Hold 17," said the cargo master.

"Fine," said Channing. "What size?"

"Three inches by six feet."

"It'll be tricky work, and you'll have to wait until your cut edge has cooled before you hook on the rods," mused Don. "But that's the ticket."

"Which floors do you want?"

"Have you got a scale drawing of the *Solar Queen?*"

"Sure."

"Then this is where my tablecloth artistry falls flat. The focusing of an electron beam depends upon the electrode spacing and the voltage. Since our voltage is fixed if we take it from the driver electrodes, we'll have to do some mighty fine figuring. I'll need that scale drawing."

Channing's tablecloth engineering was not completely wasted. By the time the scale drawing was placed before him, Channing had half of the table filled with equations. He studied the drawing, and selected the levels which were to serve as electrodes. He handed the drawing to Hadley, and the power engineer began to issue instructions to his gang.

Then the central well began to swarm with spacesuited men who bore cutting torches. Hot sparks danced from the cut girders that held the floorings, and at the same time, a crew of men were running cables from the various levels to the instrument room. More hours passed while the circular sections were insulated with the plastic rods.

The big dome above was cut in sections and removed, and then the sky could be seen all the way from the bottom of the ship where the pilot's greenhouse should have been.

Channing looked it over and then remarked: "All we need now is an electron collector."

"I thought you wanted to shoot 'em off," objected Hadley.

"I do. But we've got to have a source of supply. You can't toss baseballs off of the Transplanet Building in Northern Landing all afternoon, you know, without having a few brought to you now and then. Where do you think they come from?"

"Hadn't thought of it in that way. What'd happen?"

"We'd get along for the first umpty-gillion electrons, and then all the soup we could pack on would be equalized by the positive charge on the ship and we couldn't shoot out any more until we got bombarded by the sun—and that bombardment is nothing to write home about as goes quantity. What we need is a selective solar intake plate of goodly proportions."

"We could use a mental telepathy expert, too. Or one of those new beams that Baler and Carroll dug up out of the Martian desert. I've heard that those things will actually suck power out of any source, and bend beams so as to enter the intake vent, or end."

"We haven't one of those, either. Fact of the matter is," grinned Channing ruefully, "we haven't much of anything but our wits."

"Unarmed, practically," laughed Hadley.

"Half armed, at least. Ah, for something to soak up electrons. I'm now wondering if this electron gun is such a good idea."

"Might squirt some protons out the other direction," offered Hadley.

"That would leave us without either," said Don. "We'd be like the man who tossed baseballs off of one side and himself off the other— Hey! Of course we have some to spare. We can cram electrons out of the business end, thus stripping the planetary rings from the atoms in our cathode. From the far side we'll shoot the canal rays, which in effect will be squirting protons, or the nuclei. Since the planetaries have left for the front, it shouldn't be hard to take the protons away, leaving nothing. At our present voltages, we might be able to do it." Channing began to figure again, and he came up with another set of anodes to be placed beyond the cathode. "We'll ventilate the cathode and hang these negative electrodes on the far side. They will attract the protons, impelled also by the positive charge on the front end. We'll maintain a balance that way, effectively throwing away the whole atomic structure of the cathode. The latter will fade, just as the cathodes do in the driving tubes, only we'll be using electronic power instead of sub-electronic. Y'know, Hadley, some day someone is going to find a way to detect the—we'll call it radiation for want of anything better—of the driver. And then there will open an entirely new field of energy. I don't think that anybody has done more about the so-called sub-electronic field than to make a nice, efficient driving device out of it.

"Well, let's get our canal-ray electrodes in place. We've got about two hours before they realize that we aren't going to come in at Mojave. Then another two hours worth of wild messages between the Relay Station and Mojave. Then we can expect someone to be on the lookout. I hope to be there when they begin to look for us. At our present velocity, we'll be flirting with the Asteroid Belt in less than nothing flat. That isn't too bad—normally—but we're running without any meteor detector and autopilot coupler. We couldn't duck anything from a robin's egg on up."

"We'll get your anodes set," said Hadley.

Walt Franks grinned at Arden Channing. "That'll burn him," he assured her.

"It's been on the way for about twenty minutes," laughed Arden. "I timed it to arrive at Terra at the same time the *Solar Queen* does. They'll send out a special messenger with it, just as Don is getting aboard his little scooter. It'll be the last word, for we're not following him from Terra to here."

"You know what you've started?" asked Franks.

"Nothing more than a little feud between husband and self."

"That's just the start. Before he gets done, Don will have every ship capable of answering back. I've found that you can catch him off base just once. He's a genius—one of those men who never make the same mistake twice. He'll never again be in a position to be on the listening end only."

"Don's answer should be on the way back by now," said Arden. "Could be you're right. Something should be done."

"Sure I'm right. Look at all the time that's wasted in waiting for a landing to answer 'grams. In this day and age, time is money, squared. The latter is to differentiate between this time and the first glimmering of speedy living."

"Was there a first glimmering?" asked Arden sagely. "I've often thought that the speed-up was a stable acceleration from the dawn of time to the present."

"All right, go technical on me," laughed Walt. "Things do move. That is, all except that message from your loving husband."

"You don't suppose he's squelched?"

"I doubt it. Squelching Donald Channing is a job for a superbeing. And I'm not too sure that a superbeing could squelch Don and make him stay squelched. Better check on Mojave."

"Gosh, if Don missed the *Solar Queen* and I've been shooting him all kinds of screwy 'types every hour on the hour; Walt, that'll keep him quiet for a long, long time."

"He'd have let you know."

"That wouldn't have been so bad. But if the big bum missed and was ashamed of it—that'll be the payoff. Woah, there goes the 'type!"

Arden drew the tape from the machine:

MESSAGE BEING HELD FOR ARRIVAL OF *SOLAR QUEEN*.

Walt looked at his watch and checked the course constants of the *Solar Queen*. He called the beam-control dome and asked for the man on the *Solar Queen* beam.

"Benny," he said, "has the *Solar Queen* arrived yet?"

"Sure," answered Benny. "According to the mechanical mind here. they've been on Mojave for twenty minutes."

"Thanks." To Arden he said: "Something's strictly fishy."

Arden sat at the machine and pounded the keys:

SOLAR QUEEN DUE TO ARRIVE AT 19:06:41. IT IS NOW 19:27:00. BEAM CONTROL SAYS TRANSMISSIONS ENDED BECAUSE OF COINCIDENCE BETWEEN TERRA BEAM AND STATION-TO-SHIP BEAM. PLEASE CHECK.

Arden fretted and Walt stamped up and down the room during the long minutes necessary for the message to reach Terra and the answer to return. It came right on the tick of the clock:

HAVE CHECKED COURSE CONSTANTS. *SOLAR QUEEN* OVERDUE NOW FIFTY MINUTES. OBVIOUSLY SOMETHING WRONG. CAN YOU HELP?

Walt smiled in a grim fashion. "Help!" he said. "We go on and on for years and years with no trouble—and now we've lost the third ship in a row."

"They claim that those things always run in threes," said Arden. "What are we going to do?"

"I don't know. We'll have to do something. Funny, but the one reason we must do something is the same reason why something can be done."

"I don't get that."

"With Channing on the *Solar Queen,* something can be done. I don't know what, but I'll bet you a new hat that Don will make it possible for us to detect the ship. There is not a doubt in my mind that if the ship is still spaceworthy, we can narrow the possibilities down to a thin cone of space."

"How?"

"Well," said Franks, taking the fountain pen out of the holder on the desk and beginning to sketch on the blotter, "the course of the *Solar Queen* is not a very crooked one, as courses go. It's a very shallow skew curve. Admitting the worst, collision, we can assume only one thing. If the meteor were small enough to leave the ship in a floating but undirigible condition, it would also be small enough to do nothing to the general direction of the ship. Anything else would make it useless to hunt, follow?"

"Yes, go on."

"Therefore we may assume that the present position of the *Solar Queen* is within the volume of a cone made by the tangents of the outermost elements of the space curve that is the *Solar Queen's* course. We can take an eight-thousand-mile cylinder out of one place—for the origin of their trouble is between Mars and Terra and the 'shadow' of Terra in the cone will not contain the *Solar Queen.*"

"Might have passed close enough to Terra to throw her right into the 'shadow' of Terra by attraction," objected Arden.

"Yeah, you're right. O.K., so we can't take out that cylinder of space. And we add a sort of sidewise cone on to our original cone, a volume through which the *Queen* might have flown after passing close enough to Terra to be deflected. I'll have the slipstick experts give a guess as to the probability of the *Queen's* course, and at the same time we'll suspend all incoming operations. I'm going to set up every kind of detector I can think of, and I don't want anything upsetting them."

"What kind of stuff do you expect?" asked Arden.

"I dunno. They might have a betatron aboard. In that case we'll eventually get a blast of electrons that'll knock our front teeth out.

Don may succeed in tinkering up some sort of electrostatic field. We can check the solar electrostatic field to about seven decimal places right here, and any deviation in the field to the tune of a couple of million electron volts at a distance of a hundred million miles will cause a distortion in the field that we can measure. We'll ply oscillating beams through the area of expectation and hope for an answering reflection, though I do not hope for that. We'll have men on the lookout for everything from smoke signals to helio. Don't worry too much, Arden, your husband is capable of doing something big enough to be heard. He's just the guy to do it."

"I know," said Arden soberly. "But I can't help worrying."

"Me, too. Well, I'm off to set up detectors. We'll collect something."

"Have we got anything like a piece of gold leaf?" asked Channing.

"I think so, why?"

"I want to make an electroscope. That's about the only way I'll know whether we are getting out with this cockeyed electron gun."

"How so?" asked Hadley.

"We can tell from the meter that reads the beam current whether anything is going up the pipe," explained Channing. "But if we just build us up a nice heavy duty charge—as shown by the electroscope—we'll be sure that the electrons are not going far. This is one case where no sign is good news."

"I'll have one of the boys set up an electroscope in the instrument room."

"Good. And now have the bird on the telescope forget trying to find Venus Equilateral by dead reckoning and sight. Have him set the scope angles to the figures here, and then have him contact Darlange and have the ship slued around so that Venus is on the cross hairs. That'll put us on a line for the Station by a few thousand miles. We can afford to miss. A bundle of electrons of our magnitude zipping past the detectors that Walt can set up will make a reading."

Hadley called the observation dome. "Tim," he said, giving a string of figures, "set your 'scope for these and then get Darlange to slue the crate around so that your cross hairs are on Venus."

"O.K.," answered Tim. "That's going to be a job. This business of looking through a 'scope while dressed in a spacesuit is no fun. Here goes."

He called Darlange, and the communicator system permitted the men in the instrument room to hear his voice. "Dar," he said, "loop us around about forty-one degrees from Driver 3."

Darlange said: "Right!" and busied himself at his buttons.

"Three degrees on Driver 4."

"Right."

"Too far, back her up a degree on 4."

Darlange laughed. "What do

you think these things are, blocks and tackles? You mean: 'Compensate a degree on 2.' "

"You're the pilot. That's the ticket—and I don't care if you lift it on one hand. Can you nudge her just a red hair on 3?"

"Best I can do is a hair and a half," said Darlange. He gave Driver 3 just a tiny, instantaneous surge.

"Then take it up two and back one and a half," laughed Tim. "Woah, Nellie, you're on the beam."

"Fine."

"O.K., Dar, but you'll have to play monkey on a stick. I'll prime you for any moving so that you can correct immediately."

"Right. Don, we're on the constants you gave us. What now?"

"At this point I think a short prayer would be of assistance," said Channing soberly. "We're shooting our whole wad right now."

"I hope we make our point."

"Well, it's all or nothing," agreed Don as he grasped the switch.

He closed the switch, and the power demand meters jumped up across their scales. The gold-leaf electroscope jumped once; the ultra-thin leaves jerked apart by an inch, and then oscillated stiffly until they came to a balance. Channing, who had been looking at them, breathed deeply and smiled.

"We're getting out," he said.

"Can you key this?" asked Hadley.

"No need," said Channing. "They know we're in the grease. We know that if they can collect us, they'll be on their way. I'm going to send out for a half-hour, and then resort to a five-minute transmission every fifteen minutes. They'll get a ship after us with just about everything we're likely to need, and they can use the five-minute transmissions for direction finding. The initial shot will serve to give them an idea as to our direction. All we can do now is to wait."

"And hope," added Captain Johannson.

Electrically, Venus Equilateral was more silent than it had ever been. Not an electrical appliance was running on the whole station. People were cautioned about walking on deep-pile rugs, or combing their hair with plastic combs, or doing anything that would set up any kind of electronic charge. Only the highly filtered generators in the power rooms were running and these had been shielded and filtered long years ago; nothing would emerge from them to interrupt the ether. All incoming signals were stopped.

And the men who listened with straining ears claimed that the sky was absolutely clear save for a faint crackle of cosmic static which they knew came from the corona of the sun.

One group of men sat about a static-field indicator and cursed the minute wiggling of the meter, caused by the ever-moving celestial bodies and their electronic charges.

A sunspot emission passed through the Station once, and though it was but a brief passage, it sent the electrostatic field crazy and made the men jump.

The men who were straining their ears to hear became nervous, and were jumping at every loud crackle.

And though the man at the telescope knew that his probability of picking up a sight of the *Solar Queen* was as slender as a spider's web, he continued to search the starry heavens. He swept the narrow cone of the heavens wherein the *Solar Queen* was lost according to the mathematical experts, and he looked at every bit of brightness in the field of his telescope as though it might be the missing ship.

The beam-scanners watched their return-plates closely. It was difficult because the receiver gains were set to maximum, and every tick of static caused brief flashes of light upon their plates. They would jump at such a flash and watch for it to reappear on the next wipe, for a continuous spot of light indicated the ship they sought. Then, as the spot did not reappear, they would go on with their beams to cover another infinitesimal portion of the sky. Moving forward across the cone of expectancy bit by bit, they crossed and recrossed until they were growing restive.

Surely the ship must be there!

At the South End landing stage, a group of men were busy stocking a ship. Supplies and necessities were carried aboard, while another group of men tinkered with the electrical equipment. They cleared a big space in the observation dome, and began to install a replica of the equipment used on the Station for detection. No matter what kind of output Channing sent back, they would be able to follow it to the bitter end.

They made their installations in duplicate, with one piece of each equipment on opposite sides of the blunt dome. Balancing the inputs of each kind by turning the entire ship would give them a good indication of direction.

Franks did not hope that the entire installation could be completed before the signal came, but he was trying to outguess himself by putting some of everything aboard. When and if it came, he would be either completely ready with everything or he at least would have a good start on any one of the number of detectors. If need be, the equipment from the Station itself could be removed and used to complete the mobile installation.

Everything was in a complete state of nervous expectancy. Watchers watched, meter readers squinted for the barest wiggle, audio observers listened, trying to filter any kind of man-made note out of the irregular crackle that came in.

And the Station announcing equipment was dead quiet, to be used only in case of emergency or to announce the first glimmer of radiation, whether it be material, electrical, kinetic, potential, or wave front.

Long they listened—and then it came.

The Station announcing equipment broke forth in a multitude of voices.

"Sound input on radio."

"Visual indication on scanner plates!"

"Distortion on electrostatic field indicator."

"Super-electroscopes indicate negative charge!"

"Nothing on the telescope!"

There were mingled cheers and laughter as the speaker system broke away from its babel, and each group spoke its piece with no interference. Walt Franks left the ship at the South End and raced to the Beam Control dome, just as fast as the runway car would take him. He ran into the dome in spacesuit and flipped the helmet back over his shoulders. "What kind of indication?" he yelled.

Men crowded around him, offering him papers and shouting figures.

"Gosh," he said, "Don can't have everything going up there."

"He's hit just about everything but the guy squinting through the 'scope."

"What's he doing?" asked Franks of no one in particular.

One of the radiation engineers who had been busy with the electrostatic field indicator said: "I think maybe he's using some sort of electron gun—like the one you tried first off on the meteor-destroyer-job, remember?"

"Yeah, but that one wouldn't work—unless Don has succeeded in doing something that we couldn't do. Look, Charley, we haven't had time to set up a complete field indicator on the ship. Grab yours and give the boys a lift installing it, hey?"

"Sure thing."

"And look, fellows, any indication of direction, velocity, or distance?"

"Look for yourself," said the man on the beam scanner. "The whole plate is shining. We can't get a fix on them this way—they're radiating themselves and that means that our scanner-system finder is worthless."

"We can, but it's rough," offered one of the radio men. "It came from an area out beyond Terra—and as for our readings it might have covered a quarter of the sky."

"The field indicator is a short-base finder," explained Charley. "And no less rough than the radio boys. I'd say it was out beyond Terra by fifty million miles at least."

"Close enough. We'll have to track 'em down like a radio-equipped bloodhound. Charley, come along and run that mechanico-electro-monstrosity of yours. Gene, you can come along and run the radio finder. Oh yes, you, Jimmy, may continue to squint through that eyepiece of yours—but on the *Relay Girl*. We need a good, first-class squinter, and you should have an opportunity to help."

Jimmy laughed shortly. "The only guy on the Station that didn't get an indication was me. Not even a glimmer."

"Channing didn't know we'd be *looking* for him, or he'd probably light a flare, too. Cheer up, Jimmy, after all this crude, electrical rigamarole is finished, and we gotta get right down to the last millimeter, it's the guy with the eye that polishes up the job. You'll have your turn."

Twenty minutes after the first glimmer of intelligent signal, the *Relay Girl* lifted from the South End and darted off at an angle, setting her nose roughly in the direction of the signal.

Her holds were filled with spare batteries and a whole dozen replacement cathodes as well as her own replacements. Her crew was filled to the eyebrows with gravanol, and there must have been a mile of adhesive tape and cotton on their abdomens. At 6-G she left, and at 6-G she ran, her crew immobilized but awake because of the gravanol. And though the acceleration was terrific, the tape kept the body from folding of its own weight. When they returned, they would all be in the hospital for a week, but their friends would be with them.

Ten minutes after take-off, the signals ceased.

Walt said: "Keep her running. Don's saving electricity. Tell me when we pick him up again."

Franklen, the pilot, nodded. "We haven't got a good start yet. It'll be touch and go. According to the slipstick boys, they must be clapping it up at between twenty-five hundred and five thousand miles per second to get that far—and coasting free or nearly so. Otherwise they'd have come in. Any suggestions as to course?"

"Sure. Whoop it up at six until we hit about six thousand. Then decelerate to four thousand by using 1-G. We'll vacillate in velocity between four and five until we get close."

Forty-one hours later, the *Relay Queen* made turnover and began to decelerate.

Channing said to Captain Johannson: "Better cut the decel to about a quarter-G. That'll be enough to keep us from bumping our heads on the ceiling and it will last longer. This is going to be a long chase, and cutting down a few MPS at a half-G isn't going to make much never-mind. I'll hazard a guess that the boys are on their way right now."

"If you say so," said Johannson. "You're the boss from now on. You know that wild bunch on the Station better than I do. For myself, I've always felt that an answer was desirable before we do anything."

"I know Franks and my wife pretty well—about as well as they know me. I've put myself in Walt's place—and I know that Walt would do. So—if Walt didn't think of it, Arden would—I can assume that they are aware of us, have received

our signals, and are, therefore, coming along as fast as they can. They'll come zipping out here at from five to seven-G to what they think is halfway and then decelerate again to a sane velocity. We won't catch sight of them for sixty or seventy hours, and when we do, they'll be going so fast that it will take another twenty hours worth of manipulation to match their speed with ours. Meanwhile, I've got the gun timed to shoot our signal. When the going gets critical, I'll cut the power and make it continuous."

"You're pretty sure of your timing?"

"Well, the best they can do as for direction and velocity and distance is a crude guess. They'll place us out here beyond Terra somewhere. They'll calculate the course requirements to get us this far in the time allotted, and come to a crude figure. I'd like to try keying this thing, but I know that keying it won't work worth a hoot at this distance. Each bundle of keyed electrons would act as a separate negative charge that would spread out and close up at this distance. It's tough enough to hope that the electron beam will hold together that far, let alone trying to key intelligence with it. We'll leave well enough alone—and especially if they're trying to get a fix on us; there's nothing worse than trying to fix an intermittent station. Where are we now?"

"We're on the inner fringe of the Asteroid Belt, about thirty million miles North, and heading on a secant course at thirty-four hundred MPS."

"Too bad Jupiter isn't in the neighborhood," said Channing. "We'll be flirting with his orbit by the time they catch us."

"Easily," said Johannson. "In sixty hours, we'll have covered about six hundred and fifty million miles. We'll be nearer the orbit of Saturn, in spite of the secant course."

"Your secant approaches a radius as you get farther out," said Don, absently. "As far as distances go.

Ah, well, Titan, here we come!"

Johannson spoke to the doctor. "How're we doing?"

"Pretty well," said Doc. "There's as pretty an assortment of fractured ribs, broken limbs, cracked clavicles, and scars, mars, and abrasions as you ever saw. There are a number dead, worse luck, but we can't do a thing about them. We can hold on for a week as far as food and water goes. Everyone is now interested in the manner of our rescue rather than worrying about it." He turned to Channing. "The words Channing and Venus Equilateral have wonderful healing powers," he said. "They all think your gang are part magician and part sorcerer."

"Why, for goodness' sake?"

"I didn't ask. Once I told 'em you had a scheme to contact the Relay Station, they were all satisfied that things would happen for the better."

"Anything we can do to help you out?"

"I think not," answered Doc. "What I said before still goes. Your job is to bring aid—and that's the sum total of your job. Every effort must be expended on that and that alone. You've got too many whole people depending on you to spend one second on the hurt. That's my job."

"O.K.," said Channing. "But it's going to be a long wait."

"We can afford it."

"I hope we're not complicating the job of finding us by this quartering deceleration," said Johannson.

"We're not. We're making a sort of vector from our course, but the deviation is very small. As long as the fellows follow our radiation, we'll be found," Channing said with a smile. "The thing that is tough is the fact that all the floors seem to lean over."

"Not much, though."

"They wouldn't lean at all if we were running with the whole set of equipment," said Darlange. "We run a complete turnover without spilling a drop from the swimming pool."

"Or even making the passengers aware of it unless they're looking at the sky."

"Stop worrying about it," said Doc. "I'm the only guy who has to worry about it and as long as the floor is still a floor, I can stand sliding into the corner once in a while."

"We might tinker with the turnover drivers," offered Don. "We can bring 'em down to a place where the velocity-deceleration vectors are perpendicular to the floor upon which we stand while our ship is sluing. We've got a lot of time on our hands, and I, for one, feel a lot happier when I'm doing something."

"It's a thought," said Hadley. "Wanna try it?"

"Let's go."

Thirty hours after the *Relay Girl* left the Station, Walt and Franklen held a council of war, in which Charley Bren was the prime factor.

"We've come about two hundred million miles, and our present velocity is something like four thousand miles per second," said Walt. "We're going out towards Mars on a slightly-off radial course, to the North of the ecliptic. That means we're a little over a quarter of a billion miles from Sol, or about to hit the Asteroid Belt. Thinking it over a little, I think we should continue our acceleration for another thirty hours. What say?"

"The field has shown no change in intensity that I can detect," said Bren. "If they haven't dropped their radiated intensity, that means that we are no closer to them than we were before. Of course, we'd probably have to cut the distance by at least a half before any measurable decrement made itself evident."

"They must be on the upper limit of that four thousand MPS," observed Walt. "There's one thing certain, we'll never catch them by matching their speed."

"Where will another thirty hours at 6-G put us and how fast?" asked Franklen.

Silence ensued while they scribbled long figures on scratch paper.

"About eight hundred million miles from Sol," announced Walt.

"And about eight thousand MPS," added Charley.

"That's a little extreme, don't you think?" asked Franklen.

"By about thirty percent," said Walt, scratching his chin. "If we hold to our original idea of hitting it for six thousand, where will we be?"

"That would make it about forty-five hours from take-off, and we'd be about four hundred and sixty million miles from Sol." Charley grinned widely and said: "By Jove!"

"What?"

"By Jove!"

"'By Jove!' What?"

"That's where we'd be—By Jove!"

"Phew."

"I agree with you," said Franklen to Walt. "Better ignore him."

"Sure will after that. So then we'll be 'By Jove' at six thousand. That would be a swell place to make turnover, I think. At 1-G decel, to about four thousand MPS, that'll put us about . . . um, that'd take us ninety hours! We'll make that 3-G, at twenty hours, which will put us about three hundred and fifty million miles along, which plus the original four hundred and sixty million adds up to eight hundred and ten million miles—"

"When an astronaut begins to talk like that," interrupted Arden, "we of the skyways say that he is talking in Congressional figures. The shoe is on the other foot. What on earth are you fellows figuring?"

"Where we'll be and how fast we'll be going at a given instant of no particular importance," offered Walt. "When did you wake up?"

"About the third hundred million. All of those ciphers going by made a hollow sound, like a bullet whistling in the wind."

"Well, we're trying to make the

theories of probability match with figures. We'll know in about forty-five hours whether we were right or not."

"It's a good thing we have all space to go around in. Are you sure that we have all eternity?"

"Don't get anxious. They're still coming in like a ton of bricks four times per hour, which means that they're riding easy. I don't want to overrun them at about three thousand MPS and have to spend a week decelerating, returning, more decelerating, and then matching velocities."

"I see. You know best. And where is this Asteroid Belt that I've heard so much about?"

"To the South of us by a few million miles. Those bright specks that you can't tell from stars are asteroids. The common conception of the Asteroid Belt being filled to overflowing with a collection of cosmic rubble like the rings of Saturn is a lot of hooey. We'll be past in a little while and we haven't even come close to one. Space is large enough for all of us, I think."

"But not when all of us want the same space."

"I don't care for their area," said Walt with a smile. "Let 'em have it, I don't care. I'll stay up here and let them run as they will."

"You mean the ones that are moving downward?" asked Arden, indicating the sky.

"Those are asteroids, yes. We're to the North, as you may check by going around the ship to the opposite side. You'll see Polaris almost directly opposite, there. Sol is almost directly below us, and that bright one that you can see if you squint almost straight up out of the port is Saturn."

"I won't bother crossing the ship to see Polaris. I prefer the Southern Cross anyway. The thing I'm most interested in is: Are we accomplishing anything?"

"I think that we've spent the last thirty hours just catching up," explained Walt. Up to right now we were going backwards, so to speak; we're on even terms now, and will be doing better from here on in."

"It's the waiting that gets me down," said Arden. "Oh, for something to do!"

"Let's eat," suggested Walt. "I'm hungry, and now that I think of it, I have not eaten since we left the Station. Arden, you are hereby elected to the post of galley chief. Get Jimmy from the dome if you need help."

"Help? What for?"

"He can help you lift it out of the oven. Don must have a cast-iron stomach."

"That's hearsay. I'll show you! As soon as I find the can opener, breakfast will be served."

"Make mine dinner," said Charley. "We've been awake all the time."

"O.K., we will have a combined meal, from grapefruit to ice cream. Those who want any or all parts may choose at will. And fellows, please let me know as soon as you get something tangible."

"That's a promise," said Walt.

"Take it easy, and don't worry. We'll be catching up with them one of these days."

"Hadley, how much coating have we got on those cathodes?"

"Not too much. We had about twenty G hours to begin with. We went to a half G for about twenty hours, and now we're running on a quarter G, which would leave us go for forty hours more. That's a grand total of about sixty hours."

"And the batteries?"

"In pretty good shape."

"Well, look. If it should come to a choice between floor and signal gun, we'll choose the gun. We've about twelve hours left in the cathodes, and since everybody is now used to quarter G we might even slide it down to an eighth G, which would give us about twenty-four hours."

"Your gun is still putting out?"

"So far as I can tell. Ten hours from now, we should know, I think, predicating my guess on whatever meager information they must have."

"We could save some juice by killing most of the lights in the ship."

"That's a thought. Johannson, have one of your men run around and remove all lights that aren't absolutely necessary. He can kill about three quarters of them, I'm certain. That'll save us a few kilowatt hours," said Channing. "And another thing. I'm about to drop the power of our electron gun and run it continuously. If the boys are anywhere in the neighborhood, they'll be needing the continuous disturbance for direction finding. I'd say in another five hours that we should start continuous radiation."

"You know, Channing, if this thing works out all right, it will be a definite vote for pure, deductive reasoning."

"I know. But the pure deduction is not too pure. It isn't guesswork. There are two factors of known quantity. One is that I know Walt Franks, and the other is that he knows me. The rest is a simple matter of the boys on the Station knowing space to the last inch, and applying the theory of probabilities to it. We'll hear from them soon, or I'll miss my guess. You wait."

"Yeah," drawled Captain Johannson, "we'll wait!"

Charley Bren made another computation and said: "Well, Walt, we've been narrowing them down for quite a time now. We're getting closer and closer to them, according to the field intensity. I've just got a good idea of direction on that last five-minute shot. Have Franklen swivel us around on this course; pretty soon we'll be right in the middle of their shots."

"We're approaching them asymptotically," observed Walt. "I wish I knew what our velocity was with respect to theirs. Something tells me that it would be much simpler if I knew."

"Walt," asked Arden, "how close

can you see a spaceship?"

"You mean how far? Well, I don't know that it's ever been tried and recorded. But we can figure it out easy enough, by analogy. A period is about thirty thousandths of an inch in diameter, and visible from a distance of thirty inches. I mean visible with no doubt about it's being there. That's a thousand to one. Now, the *Solar Queen* is about six hundred feet tall and about four hundred feet in its major diameter, so we can assume a little more than the four hundred feet—say five hundred feet average of circular area, say—follow me?"

"Go on, you're vague, but normal."

"Then at a thousand to one, that becomes five hundred thousand feet, and dividing by five thousand—round figures because it isn't important enough to use that two hundred and eighty feet over the five thousand—gives us one thousand miles. We should be able to see the *Solar Queen* from a distance of a thousand miles."

"Then at four thousand miles per second we'll be in and out of visual range in a half second?"

"Oh no. They're rambling on a quite similar course at an unknown but high velocity. Our velocity with respect to theirs is what will determine how long they're within visual range."

"Hey, Walt," came the voice of Charley Bren. "The intensity of Don's beam has been cut to about one quarter and is now continuous. Does that mean anything?"

"Might mean trouble for them. Either they're running out of soup and mean for us to hurry up, or they assume we're close enough to obviate the need for high power. We'd better assume they want haste and act accordingly. How're the boys on the radio detectors coming along?"

"Fine. They've taken over the direction-finding and claim that we are right on their tail."

"Anything in the sights, Jimmy?"

"Not yet. But the electroscope boys claim that quarter power or not, the input is terrific."

"Take a rest, Jimmy. We won't be there for a while yet. No use burning your eyes out trying to see 'em. There'll be time enough for you to do your share after we get 'em close enough to see with the naked eye. What do the beam-scanners say?"

"Shucks," answered the man on the scanners, "they're still radiating. How are we going to fix 'em on a reflected wave when they're more powerful on their own hook? The whole plate is glaring white. And, incidentally, so is the celestial globe in the meteor spotter. I've had the threshold cut to the devil on that or we'd never be able to hold this course. Anything like a meteor that comes in our way now will not register until we're right on top of it and—"

The *Relay Girl* lurched sickeningly. All over the ship, things rattled and fell to the floors. Men grabbed at the closest solid object, and then the *Relay Girl* straightened out once more.

"Woosh," said Franks. "That was a big one."

"Big one?" called Charley Bren. "That, my friend, was none other than the *Solar Queen!*"

"Can you prove that?"

"Sure. Our electroscopes now indicate a positive charge; they crossed over just as we lurched."

"Jimmy, get your scope a-top and get looking. Franklen, hang on about 7-G and follow Jimmy's orders. Charley, see if you can get anything cogent out of your gadget. Holy Green Fire, with all of a cubic million million million megaparsecs in which to run, we have to be so good that we run right into our quarry. Who says that radio direction finding is not a precise science? Who says that we couldn't catch—"

"Walt, they're in sight, but losing fast."

"O.K., Jimmy, can you give me any idea as to their velocity with respect to ours?"

"How long is she?"

"Six hundred feet."

Jimmy was silent for some seconds. "They're out of sight again, but I make it about four to seven hundred miles per second."

"At 7-G we should match that seven hundred in about four hours."

"And then go on decelerating so that they'll catch up?"

"No," said Walt. "I used the max figure and we can assume that they aren't going that fast, quite. At the end of four hours, we'll turnover and wait until they heave in sight again and then we'll do some more oscillating. We can match their velocity inside of ten hours, or Franklen will get fired."

"If I don't," promised Franklen, "I'll quit. You can't fire me!"

"We should be able to contact them by radio," said Walt.

"Their beam is off," said Bren.

"And they are using the landing set," called the radio man. "It's Channing. He says: 'Fancy meeting you here.' Any answer?"

"Just say, 'Dr. Channing, I presume?' "

Channing's voice came out of the ship's announcer system as the radio man made the necessary connections. It said: "Right—but what kept you so long?"

"Our boss was away," said Walt. "And we can't do a thing without him."

"Some boss. Some crew of wild men. Can't go off on a fishing trip without having my bunch chasing all over the Solar System."

"What's wrong with a little sightseeing tour? We didn't mean any harm. And speaking of harm, how are you and the rest of that bunch getting along?"

"We're O.K. What do you plan after we finally get close enough together to throw stones across?"

"We've got a whole hold full of spare batteries and a double set of replacement cathodes. There is a shipload of gravanol aboard, too. You'll need that and so will we. By the time we finish this jaunt, we'll have been about as far out as anybody ever gets."

"Yeah—got any precise figures? We've been running on a guess and a hope. I make it out about seven hundred million."

"Make it eight and a half. At 6-G, you'll cover another hundred and fifty million miles before you stop. Take it twenty-two hours at 6-G—and then another twenty-two at 6. That should put you right back here but going the other way at the same velocity. But wait, you've been coasting. Mark off that last twenty-two hours and make it like this: You'll be one thousand million miles from Sol when you come to a stop at the end of the first twenty-two hours at 6-G. That hangs you out beyond the orbit of Saturn by a couple of hundred million. Make it back forty-four hours at 6-G, turnover and continue. By that time we'll all be in so close that we can make any planet at will—preferably you to Terra and we'll head for Venus Equilateral. You'll come aboard us? No need for you to go with the rest."

"I can have the scooter sent out," said Channing. "How's Arden?"

"I'm fine, you big runabout. Wait until I get you!"

"Why Arden, I thought you might be glad to see me."

"Glad to see you?"

"But Arden—"

"Don't you 'But Arden' me, you big gadabout. Glad to see you? Boy, any man that makes me chase him all over the Solar System! You just wait. As soon as I get ahold of you, Don Channing, I'm going to—bust out and bawl like a kid! Hurry up, willya?"

"I'll be right over," said Don soberly.

And, strangely enough, Don did not deviate this time.

THE END.

IN TIMES TO COME

The "object" of a disease germ might be said to be the attainment of a perfect parasitical relationship—and that requires that the germ does not kill its host, nor so weaken the host as to cause death indirectly, nor can the germ irritate the host's metabolism to a point that brings an anti-body reaction that ousts the parasite. The ultimate success, of course, is a symbiotic arrangement, where host and parasite merge in a mutual operation. If the germ is extremely alien to the host, the parasitism never gets started; violent warfare of a chemical nature starts at once, with the inevitable defeat of the microscopic attacker. The world crawls with bacteria: only a minute fraction of the microorganisms have metabolic processes close enough to Man's to be able to cause disease in man.

When men first go to alien planets, it is highly improbable that they will fall victim to microorganisms of those other worlds; metabolic chemistry is so immensely complex the chance that the life-forms of another world could fit into mankind's processes well enough to cause trouble, disease, is remote.

But once in a million times or so it might happen that a true microorganism, or a virus, a protein molecule perhaps, could show up. The results then might well be devastating—a conflict of completely alien chemistries, perhaps mutations in the men who landed there—

That's the thought back of the thoroughly deadly self-styled supermen in E. Mayne Hull's lead yarn for next month—"The Contract." I think he has a point—

THE EDITOR.

Though Dreamers Die

by Lester del Rey

Mankind *was dead, but a man and some robots were left. But—for a special reason—it was necessary that not even a memory of Man remain!*

Illustrated by Smith

Consciousness halted dimly at the threshold and hovered uncertainly, while Jorgen's mind reached out along his numbed nerves, questing without real purpose; he was cold, chilled to the marrow of his bones, and there was an aching tingle to his body that seemed to increase as his half-conscious thought discovered it. He drew his mind back, trying to recapture a prenatal lethargy that had lain on him so long, unwilling to face this cold and tingling body again.

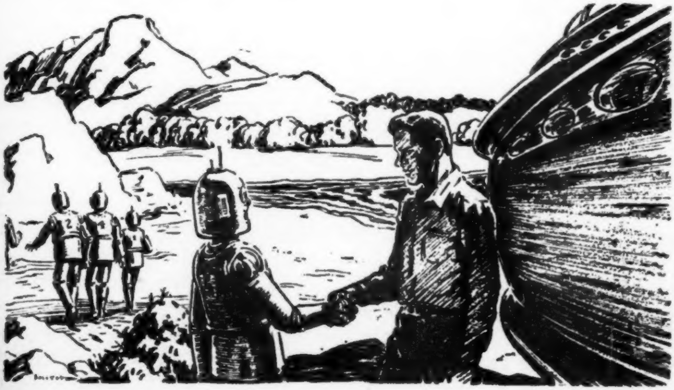
But the numbness was going, in spite of his vague desires, though his now opened eyes registered only a vague, formless light without outline or detail, and the mutterings of sound around him were without pattern or meaning. Slowly, the cold retreated, giving place to an aching throb that, in turn, began to leave; he stirred purposelessly, while little cloudy wisps of memory insisted on trickling back, trying to remind him of things he must do.

Then the picture cleared somewhat, letting him remember scattered bits of what had gone before. There had been the conquest of the Moon and a single gallant thrust on to Mars; the newscasts had been filled with that. And on the ways a new and greater ship had been building, to be powered with his new energy release that would free it from all bounds and let it go out to the farthest stars, if they chose—the final attainment of all the hopes and dreams of the race. But there was something else that eluded him, more important even than all that or the great ship.

A needle was thrust against his breast and shoved inward, to be followed by a glow of warmth and renewed energy; adrenalin, his mind recognized, and he knew that there were others around him, trying to arouse him. Now his heart was pumping strongly and the drug coursed through him, chasing away those first vague thoughts and replacing them with a swift rush of less welcome, bitter memories.

For man's dreams and man himself were dust behind him, now! Overnight all their hopes and plans had been erased as if they had never been, and the Plague had come, a mutant bacteria from some unknown source, vicious beyond imagination, to attack and destroy and to leave only death behind it. In time, perhaps, they might have found a remedy, but there had been no time. In weeks it had covered the Earth, in months even the stoutest hearts that still lived had abandoned any hope of survival. Only the stubborn courage and tired but unquenchable vigor of old Dr. Craig had remained, to force dead and dying men on to the finish of Jorgen's great ship; somehow in the mad shambles of the last days, he had collected this pitifully small crew that was to seek a haven on Mars, taking the five Thoradson robots to guide them while they protected themselves against the savage acceleration with the aid of the suspended animation that had claimed him so long.

And on Mars, the Plague had come before them! Perhaps it had been brought by that first expedition, or perhaps they had carried it back unknowingly with them; that must remain forever an unsolved mystery. Venus was uninhabitable, the other planets were useless to them, and the Earth was dead behind. Only the stars had remained, and they had turned on through sheer necessity that had made that



final goal a hollow mockery of the dream it should have been. Here, in the ship around him, reposed all that was left of the human race, unknown years from the solar system that had been their home!

But the old grim struggle must go on. Jorgen turned, swinging his trembling feet down from the table toward the metal floor and shaking his head to clear it. "Dr. Craig?"

Hard, cool hands found his shoulder, easing him gently but forcefully back onto the table. The voice that answered was metallic, but soft. "No, Master Jorgen, Dr. Craig is not here. But wait, rest a little longer until the sleep is all gone from you; you're not ready yet."

But his eyes were clearing then, and he swung them about the room. Five little metal men, four and a half feet tall, waited patiently around him; there was no other present. Thoradson's robots were incapable of expression, except for the dull glow in their eyes, yet the pose of their bodies seemed to convey a sense of uncertainty and discomfort, and Jorgen stirred restlessly, worried vaguely by the impression. Five made an undefined gesture with his arm.

"A little longer, master. You must rest!"

For a moment longer he lay quietly, letting the last of the stupor creep away from him and trying to force his still-dulled mind into the pattern of leadership that was nominally his. This time Five made no protest as he reached up to catch the metal shoulder and pull himself to his feet. "You've found a sun with planets, Five? Is that why you wakened me?"

Five shuffled his feet in an oddly human gesture, nodding, his words still maddeningly soft and slow. "Yes, master, sooner than we had hoped. Five planetless suns and ninety years of searching are gone, but it might have been thousands. You can see them from the pilot room if you wish."

Ninety years that might have been thousands, but they had won! Jorgen nodded eagerly, reaching for his clothes, and Three and Five sprang forward to help, then moved to his side to support him, as the waves of giddiness washed through him, and to lead him slowly forward as some measure of control returned. They passed down the long center hall of the ship, their metal feet and his leather boots ringing dully on the plastic-and-metal floor, and came finally to the control room, where great crystal windows gave a view of the cold black space ahead, sprinkled with bright, tiny stars; stars that were unflickering and inimical as no stars could be through the softening blanket of a planet's atmosphere. Ahead, small but in striking contrast to the others, one point stood out, the size of a dime at ten feet. For a moment, he stood staring at it, then moved almost emotionlessly toward the windows, until Three plucked at his sleeve.

"I've mapped the planets already, if you wish to see them, master.

We're still far from them, and at this distance, by only reflected light, they are hard to locate, but I think I've found them all."

Jorgen swung to the electron screen that began flashing as Three made rapid adjustments on the telescope, counting the globes that appeared on it and gave place to others. Some were sharp and clear, cold and unwavering; others betrayed the welcome haze of atmosphere. Five, the apparent size of Earth, were located beyond the parched and arid inner spheres, and beyond them, larger than Jupiter, a monster world led out to others that grew smaller again. There was no ringed planet to rival Saturn, but most had moons, except for the farthest inner planets, and one was almost a double world, with satellite and primary of nearly equal size. Planet after planet appeared on the screen, to be replaced by others, and he blinked at the result of his count. "Eighteen planets, not counting the double one twice! How many are habitable?"

"Perhaps four. Certainly the seventh, eighth and ninth are. Naturally, since the sun is stronger, the nearer ones are too hot. But those are about the size of Earth, and they're relatively closer to each other than Earth, Mars and Venus were; they should be very much alike in temperature, about like Earth. All show spectroscopic evidence of oxygen and water vapor, while the plates of seven show what might be vegetation. We've selected that, subject to your approval."

It came on the screen again, a ball that swelled and grew as the maximum magnification of the screen came into play, until it filled the panel and expanded so that only a part was visible. The bluish-green color there might have been a sea, while the browner section at the side was probably land. Jorgen watched as it moved slowly under Three's manipulations, the brown entirely replacing the blue, and again, eventually, showing another sea. From time to time, the haze of the atmosphere thickened as grayish veils seemed to swim over it, and he felt a curious lift at the thoughts of clouds and rushing streams, erratic rain and the cool, rich smell of growing things. Almost it might have been a twin of Earth, totally unlike the harsh, arid home that Mars would have been.

Five's voice broke in, the robot's eyes following his over the screen. "The long, horizontal continent seems best, master. We estimate its temperature at about that of the central farming area of North America, though there is less seasonal change. Specific density of the planet is about six, slightly greater than Earth; there should be metals and ores there. A pleasant, inviting world."

It was. And far more, a home for the voyagers who were still sleeping, a world to which they could bring their dreams and their hopes, where their children might grow up and find no strangeness to the classic literature of Earth. Mars had been grim and uninviting, something to be fought through sheer necessity. This world would be a mother to them, opening its arms in welcome to these foster children. Unless—

"It may already have people, unwilling to share with us."

"Perhaps, but not more than savages. We have searched with the telescope and camera, and that shows more than the screen; the ideal harbor contains no signs of living constructions, and they would surely have built a city there. Somehow, I . . . feel—"

Jorgen was conscious of the same irrational feeling that they would find no rivals there, and he smiled as he swung back to the five who were facing him, waiting expectantly as if entreating his approval. "Seven, then. And the trust that we placed in you has been kept to its fullest measure. How about the fuel for landing?"

Five had turned suddenly toward the observation ports, his little figure brooding over the pin-point stars, and Two answered. "More than enough, master. After reaching speed, we only needed a little to guide us. We had more than time enough to figure the required approaches to make each useless sun swing us into a new path, as a comet is swung."

He nodded again, and for a moment as he gazed ahead at the sun that was to be their new home, the long wearying vigil of the robots swept through his mind, bringing a faint wonder at the luck that had created them as they were. Anthropomorphic robots, capable of handling human instruments, walking on two feet and with two arms ending in hands at their sides. But he knew it had been no blind luck. Nature had designed men to go where no wheels could turn, to handle all manner of tools, and to fit not one but a thousand purposes; it had been inevitable that Thoradson and the brain should copy such an adaptable model, reducing the size only because of the excessive weight necessary to a six-foot robot.

Little metal men, not subject to the rapid course of human life that had cursed their masters; robots that could work with men, learning from a hundred teachers, storing up their memories over a span of centuries instead of decades. When specialization of knowledge had threatened to become too rigid and yet when no man had time enough even to learn the one field he chose, the coming of the robots had become the only answer. Before them, men had sought help in calculating machines, then in electronic instruments, and finally in the "brains" that were set to solving the problem of their own improvement among other things. It was with such a brain that Thoradson had labored in finally solving the problems of full robothood. Now, taken from their normal field, they had served beyond any thought of their creator in protecting and preserving all that was left of the human race. Past five suns and over ninety years of monotonous searching they had done what no man could have tried.

Jorgen shrugged aside his speculations and swung back to face them. "How long can I stay conscious before you begin decelerating?"

"We are decelerating—full strength." Two stretched out a hand to the instrument board, pointing to the accelerometer.

The instrument confirmed his words, though no surge of power seemed to shake the ship, and the straining, tearing pull that should have shown their change of speed was absent. Then, for the first time, he realized that his weight seemed normal here in space, far from the pull of any major body. "Controlled gravity!"

Five remained staring out of the port, and his voice was quiet, incapable of pride or modesty. "Dr. Craig set us the problem, and we had long years in which to work. Plates throughout the ship pull with a balanced force equal and opposite to the thrust of acceleration, while others give seeming normal weight. Whether we coast at constant speed or accelerate at ten gravities, compensation is complete and automatic."

"Then the sleep's unnecessary! Why—" But he knew the answer, of course; even without the tearing pressure the sleep had remained the only solution to bringing men this vast distance that had taken ninety years; otherwise they would have grown old and died before reaching it, even had their provisions lasted.

Now, though, that would no longer trouble them. A few hours only separated them from the planets he had seen, and that could best be spent here before the great windows, watching their future home appear and grow under them. Such a thing should surely be more than an impersonal fact in their minds; they were entitled to see the final chapter on their exodus, to carry it with them as a personal memory through the years of their lives and pass that memory on to the children who should follow them. And the fact that they would be expecting the harshness of Mars instead of this inviting world would make their triumph all the sweeter. He swung back, smiling.

"Come along, then, Five; we'll begin reviving while you others continue with the ship. And first, of course, we must arouse Dr. Craig and let him see how far his plan has gone."

Five did not move from the windows, and the others had halted their work, waiting. Then, reluctantly, the robot answered. "No, master. Dr. Craig is dead!"

"Craig—dead?" It seemed impossible, as impossible and unreal as the distance that separated them from their native world. There had always been Craig, always would be.

"Dead, master, years ago." There was the ghost of regret and something else in the spacing of the words. "There was nothing we could do to help!"

Jorgen shook his head, uncomprehending. Without Craig, the plans they had dared to make seemed incomplete and almost foolish. On Earth, it had been Craig who first planned the escape with this ship. And on Mars, after the robots brought back the evidence of the Plague, it had been the older man who had cut through their shock with a shrug and turned his eyes outward again with the fire of a hope that would not be denied.

"Jorgen, we used bad judgment in choosing such an obviously unsuitable world as this, even without the Plague. But it's only a delay, not the finish. For beyond, somewhere out there, there are other stars housing other planets. We have a ship to reach them, robots who can guide us there; what more could we ask? Perhaps by Centauri, perhaps a thousand light years beyond, there must be a home for the human race, and we shall find it. On the desert before us lies the certainty of death; beyond our known frontiers there is only uncertainty—but hopeful uncertainty. It is for us to decide. There could be no point in arousing the others to disappointment when some day we may waken them to an even greater triumph. Well?"

And now Craig, who had carried them so far, was dead like Moses outside the Promised Land, leaving the heritage of real as well as normal leadership to him. Jorgen shook himself, though the eagerness he had felt was dulled now by a dark sense of personal loss. There was work still to be done. "Then, at least, let's begin with the others, Five."

Five had turned from the window and was facing the others, apparently communicating with them by the radio beam that was a part of him, his eyes avoiding Jorgen's. For a second, the robots stood with their attention on some matter, and the Five nodded with the same curious reluctance and turned to follow Jorgen, his steps lagging, his arms at his sides.

But Jorgen was only half aware of him as he stopped before the great sealed door and reached out for the lever that would let him into the sleeping vault, to select the first to be revived. He heard Five's steps behind him quicken, and then suddenly felt the little metal hands hands catch at his arm, pulling it back, while the robot urged him sideways and away from the door.

"No, master. Don't go in there!" For a second, Five hesitated, then straightened and pulled the man farther from the door and down the hall toward the small reviving room nearest, one of the several provided. "I'll show you—in here! We—"

Sudden unnamed fears caught at Jorgen's throat, inspired by something more threatening in the listlessness of the robot than in the unexplained actions. "Five, explain this conduct!"

"Please, master, in here. I'll show you—but not in the main chamber—not there! This is better, simpler—"

He stood irresolutely, debating whether to use the mandatory form that would force built-in unquestioning obedience from the robot, then swung about as the little figure opened the small door and motioned, eyes still averted. He started forward, to stop abruptly in the doorway.

No words were needed. Anna Holt lay there on the small table, her body covered by a white sheet, her eyes closed, and the pain-filled grimaces of death erased from her face. There could be no question of that death, though. The skin was blotched, hideously, covered with irregular brownish splotches, and the air was heavy with the scent of musk that was a characteristic of the Plague! Here, far from the sources of the infection, with their goal almost at hand, the Plague had reached forward to claim its own and remind them that flight was not enough—could never be enough so long as they were forced to carry their disease-harboring bodies with them.

About the room, the appartus for reviving the sleepers lay scattered, pushed carelessly aside to make way for other things, whose meaning was only partially clear. Obviously, though, the Plague had not claimed her without a fight, though it had won in the end, as it always did. Jorgen stepped backward, heavily, his eyes riveted on the corpse. Again his feet groped backward, jarring down on the floor, and Five was closing and sealing the door with apathetic haste.

"The others, Five? Are they—"

Five nodded, finally raising his head slightly to meet the man's eyes. "All, master. The chamber of sleep is a mausoleum, now. The Plague moved slowly there, held back by the cold, but it took them all. We sealed the room years ago when Dr. Craig finally saw there was no hope."

"Craig?" Jorgen's mind ground woodenly on, one slow thought at a time. "He knew about this?"

"Yes. When the sleepers first showed the symptoms, we revived him, as he had asked us to do—our speed was constant then, even though the gravity plates had not been installed." The robot hesitated, his low voice dragging even more slowly. "He knew on Mars; but he hoped a serum you were given with the sleep drugs might work. After we revived him, we tried other serums. For twenty years we fought it, Master Jorgen, while we passed two stars and the sleepers died slowly, without suffering in their sleep, but in ever increasing numbers. Dr. Craig reacted to the first serum, you to the third; we thought the last had saved her. Then the blemishes appeared on her skin, and we were forced to revive her and try the last desperate chance we had, two days ago. It failed! Dr. Craig had hoped . . . two of you— But we tried, master!"

Jorgen let the hands of the robot lower him to a seat and his emotions were a backwash of confused negatives. "So it took the girl! It took the girl, Five, when it could have left her and chosen me. We had frozen spermatozoa that would have served if I'd died, but it took her instead. The gods had to leave one uselessly immune man to make their irony complete, it seems! Immune!"

Five shuffled hesitantly. "No, master."

Jorgen stared without comprehension, then jerked up his hands as the robot pointed, studying the skin on the back. Tiny, almost undetectable blotches showed a faint brown against the whiter skin, little irregular patches that gave off a faint characteristic odor of musk as he put them to his nose. No, he wasn't immune.

"The same as Dr. Craig," Five said. "Slowed almost to complete immunity, so that you may live another thirty years, perhaps, but we believe now that complete cure is impossible. Dr. Craig lived twenty years, and his death was due to age and a stroke, not the Plague, but it worked on him during all that time."

"Immunity or delay, what difference now? What happens to all our dreams when the last dreamer dies, Five? Or maybe it's the other way around."

Five made no reply, but slid down onto the bench beside the man, who moved over unconsciously to make room for him. Jorgen turned it over, conscious that he had no emotional reaction, only an intellectual sense of the ghastly joke on the human race. He'd read stories of the last human and wondered long before what it would be like. Now that he was playing the part, he still knew no more than before. Perhaps on Earth, among the ruined cities and empty reminders of the past, a man might realize that it was the end of his race. Out here, he could accept the fact, but his emotions refused to credit it; unconsciously, his conditioning made him feel that disaster had struck only a few, leaving a world of others behind. And however much he knew that the world behind was as empty of others as this ship, the feeling was too much a part of his thinking to be fully overcome. Intellectually, the race of man was ended; emotionally, it could never end.

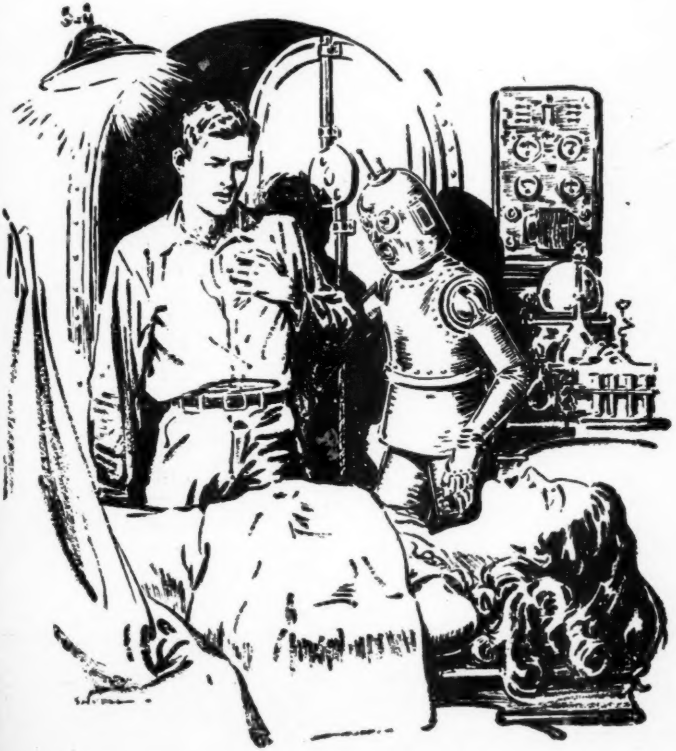
Five stirred, touching him diffidently. "We have left Dr. Craig's laboratory, master; if you want to see his notes, they're still there. And he left some message with the brain before he died, I think. The key was open when we found him, at least. We have made no effort to obtain it, waiting for you."

"Thank you, Five." But he made no move until the robot touched him again, almost pleadingly. "Perhaps you're right; something to fill my mind seems called for. All right, you can return to your companions unless you want to come with me."

"I prefer to come."

The little metal man stood up, moving down the hall after Jorgen, back toward the tail of the rocket, the sound of the metal feet matching the dumb regularity of the leather heels on the floor. Once the robot stopped to move into a side chamber and come back with a small bottle of brandy, holding it out questioningly. There was a physical warmth to the liquor, but no relief otherwise, and they continued down the hall to the little room that Craig had chosen. The notes left by the man could raise a faint shadow of curiosity only, and no message from the dead could solve the tragedy of the living now. Still, it was better than doing nothing. Jorgen clumped in, Five shutting the door quietly behind them, and moved listlessly toward the little fabrikoid notebooks. Twice the robot went quietly out to return with food that Jorgen barely tasted. And the account of Craig's useless labors went on and on, until finally he turned the last page to the final entry.

"I have done all that I can, and at best my success is only partial.



Now I feel that my time grows near, and what can still be done must be left to the robots. Yet, I will not despair. Individual and racial immortality is not composed solely of the continuation from generation to generation, but rather of the continuation of the dreams of all mankind. The dreamers and their progeny may die, but the dream cannot. Such is my faith, and to that I cling. I have no other hope to offer for the unknown future."

Jorgen dropped the notebook, dully, rubbing his hands across his tired eyes. The words that should have been a ringing challenge to destiny fell flat; the dream could die. He was the last of the dreamers, a blind alley of fate, and beyond lay only oblivion. All the dreams of a thousand generations of men had concentrated into Anna Holt, and were gone with her.

"The brain, master," Five suggested softly. "Dr. Craig's last message!"

"You operate it, Five." It was a small model, a limited fact analyzer such as most technicians used or had used to help them in their work, voice-operated, its small, basic vocabulary adjusted for the work to be done. He was unfamiliar with the semantics of that vocabulary, but Five had undoubtedly worked with Craig long enough to know it.

He watched without interest as the robot pressed down the activating key and spoke carefully chosen words into it. "Subtotal say-out! Number *n* say-in!"

The brain responded instantly, selecting the final recording impressed upon it by Craig, and repeating in the man's own voice, a voice shrill with age and weariness, hoarse and trembling with the death that was reaching for him as he spoke. "My last notes—inadequate! Dreams *can* go on. Thoradson's first analys—" For a second, there was only a slithering sound, such as a body might have made; then the brain articulated flatly: "Subtotal number *n* say-in, did say-out!"

It was meaningless babble to Jorgen, and he shook his head at Five. "Probably his mind was wandering. Do you know what Thoradson's first analysis was?"

"It dealt with our creation. He was, of course, necessarily trained in semantics—that was required for the operation of the complex brains used on the problem of robots. His first rough analysis was that the crux of the problem rested on the accurate definition of the word *I*. That can be properly defined only in terms of itself, such as the Latin cognate *ego*, since it does not necessarily refer to any physical or specifically definable part or operation of the individual. Roughly, it conveys a sense of individuality, and Thoradson felt that the success or failure of robots rested upon the ability to analyze and synthesize that."

For long minutes, he turned it over, but it was of no help in clarifying the dying man's words; rather, it added to the confusion. But he had felt no hope and could now feel no disappointment. When a problem has no solution, it makes little difference whether the final words of a man are coldly logical or wildly raving. The result must be the same. Certainly semantics could offer no hope where all the bacteriological skill of the race had failed.

Five touched his arm again, extending two little pellets toward him. "Master, you need sleep now; these —sodium amytal—should help. Please!"

Obediently, he stuffed them into his mouth and let the robot guide him toward a room fixed for sleeping, uncaring. Nothing could possibly matter now, and drugged sleep was as good a solution as any other. He saw Five fumble with a switch, felt his weight drop to a few pounds, making the cot feel soft and yielding, and then gave himself up dully to the compulsion of the drug. Five tiptoed quietly out, and blackness crept over his mind, welcome in the relief it brought from thinking.

Breakfast lay beside him, hot in vacuum plates, when Jorgen awoke finally, and he dabbled with it out of habit more than desire. Somewhere, during the hours of sleep, his mind had recovered somewhat from the dull pall that had lain over it, but there was still a curious suspension of his emotions. It was almost as if his mind had compressed years of forgetting into a few hours, so that his attitude toward the tragedy of his race was tinged with a sense of remoteness and distance, there was neither grief nor pain, only a vague feeling that it had happened long before and was now an accustomed thing.

He sat on the edge of his bunk, pulling on his clothes slowly and watching the smoke curl up from his cigarette, not thinking. There was no longer any purpose to thought. From far back in the ship, a dull drone of sound reached him, and he recognized it as the maximum thrust of the steering tubes, momentarily in action to swing the ship in some manner. Then it was gone, leaving only the smooth, balanced, almost inaudible pur of the main drive as before.

Finished with his clothes, he pushed through the door and into the hallway, turning instinctively forward to the observation room and toward the probable location of Five. The robots were not men, but they were the only companionship left him, and he had no desire to remain alone. The presence of the robot would be welcome. He clumped into the control room, noting that the five were all there, and moved toward the quartz port.

Five turned at his steps, stepping aside to make room for him and lifting a hand outward. "We'll be landing soon, master. I was going to call you."

"Thanks." Jorgen looked outward then, realizing the distance that had been covered since his first view. Now the sun was enlarged to the size of the old familiar sun over Earth, and the sphere toward which they headed was clearly visible without the aid of the 'scope.

He sank down quietly into the seat Five pulled up for him, accepting the binoculars, but making no effort to use them. The view was better as a whole, and they were nearing at a speed that would bring a closer view to him soon enough without artificial aid.

Slowly it grew before the eyes of the watchers, stretching out before them and taking on a pattern as the distance shortened. Two, at the controls, was bringing the ship about in a slow turn that would let them land to the sunward side of the planet where they had selected their landing site, and the crescent opened outward, the darkened night side retreating until the whole globe lay before them in the sunlight. Stretched across the northern hemisphere was the sprawling, horizontal continent he had seen before, a rough caricature of a running greyhound, with a long, wide river twisting down its side and emerging behind an outstretched foreleg. Mountains began at the head and circled it, running around toward the tail, and then meeting a second range along the hip. Where the great river met the sea, he could make out the outlines of a huge natural harbor, protected from the ocean, yet probably deep enough for any surface vessel. There should have been a city there, but of that there was no sign, though they were low enough now for one to be visible.

"Vegetation," Five observed. "This central plain would have a long growing season—about twelve years of spring, mild summer and fall, to be followed by perhaps four years of warm winter. The seasons would be long, master, at this distance from the sun, but the tilt of the planet is so slight that many things would grow, even in winter. Those would seem to be trees, a great forest. Green, as on Earth."

Below them, a cloud drifted slowly over the landscape, and they passed through it, the energy tubes setting the air about them into swirling paths that were left behind almost instantly.

Two was frantically busy now, but their swift fall slowed rapidly, until they seemed to hover half a mile over the shore by the great sea, and then slipped downward. The ship nestled slowly into the sands and was still, while Two cut off energy and artificial gravity, leaving the faintly weaker pull of the planet in its place.

Five stirred again, a sighing sound coming from him. "No intelligence here, master. Here, by this great harbor, they would surely have built a city, even if of mud and wattle. There are no signs of one. And yet it is a beautiful world, surely designed for life." He sighed again, his eyes turned outward.

Jorgen nodded silently, the same thoughts in his own mind. It was in many ways a world superior to that his race had always known, remarkably familiar, with even a rough resemblance between plant forms here and those he had known. They had come past five suns and through ninety years of travel at nearly the speed of light to a haven beyond their wildest imaginings, where all seemed to be waiting them, untenanted but prepared. Outside, the new world waited expectantly. And inside, to meet that invitation, there were only ghosts and emptied dreams, with one slowly dying man to see and to appreciate. The gods had prepared their grim jest with painful attention to every detail needed to make it complete.

A race that had dreamed, and pleasant worlds that awaited beyond the stars, slumbering on until they should come! Almost, they had reached it; and then the Plague had driven them out in dire necessity, instead of the high pioneering spirit they had planned, to conquer the distance but to die in winning.

"It had to be a beautiful world, Five," he said, not bitterly, but in numbed fatalism. "Without that, the joke would have been flat."

Five's hand touched his arm gently, and the robot sighed again, nodding very slowly. "Two has found the air good for you—slightly rich in oxygen but good. Will you go out?"

He nodded assent, stepping through the locks and out, while the five followed behind him, their heads turning as they inspected the planet, their minds probably in radio communication as they discussed it. Five left the others and approached him, stopping by his side and following his eyes up toward the low hills that began beyond the shore of the sea, cradling the river against them.

A wind stirred gently, bringing the clean, familiar smell of growing things, and the air was rich and good. It was a world to lull men to peace from their sorrows, to bring back their star-roving ships from all over the universe, worthy of being called home in any language. Too good a world to provide the hardships needed to shape intelligence, but an Eden for that intelligence, once evolved.

Now Jorgen shrugged. This was a world for dreamers, and he wanted only the dreams that may come with the black lotus of forgetfulness. There were too many reminders of what might have been, here. Better to go back to the ship and the useless quest without a goal, until he should die and the ship and robots should run down and stop. He started to turn, as Five began to speak, but halted, not caring enough one way or another to interrupt.

The robot's eyes were where his had been, and now swept back down the river and toward the harbor. "Here could have been a city, master, to match all the cities ever planned. Here your people might have found all that was needed to make life good, a harbor to the other continents, a river to the heart of this one, and the flat ground beyond the hills to house the rockets that would carry you to other worlds, so richly scattered about this sun, and probably so like this one. See, a clean white bridge across the river there, the residences stretching out among the hills, factories beyond the river's bend, a great park on that island."

"A public square there, schools and university grounds there." Jorgen could see it, and for a moment his eyes lighted, picturing that mighty mother city.

Five nodded. "And there, on that little island, centrally located, a statue in commemoration; winged, and with arms—no, one arm stretched upward, the other held down toward the city."

For a moment longer, the fire lived in Jorgen's eyes, and then the dead behind rose before his mind, and it was gone. He turned, muffling a choking cry as emotions came suddenly flooding over him, and Five drooped, swinging back with him. Again, the other four fell behind as he entered the ship, quietly, taking their cue from his silence.

"Dreams!" His voice compressed all blasphemy against the jest-crazed gods into the word.

But Five's quiet voice behind him held no hatred, only a sadness in its low, soft words. "Still, the dream was beautiful, just as this planet is, master. Standing there, while we landed, I could see the city, and I almost dared hope. I do not regret the dream I had."

And the flooding emotions were gone, cut short and driven away by others that sent Jorgen's body down into a seat in the control room, while his eyes swept outward toward the hills and the river that might have housed the wonderful city—no, that would house it! Craig had not been raving, after all, and his last words were a key, left by a man who knew no defeat, once the meaning of them was made clear. Dreams could not die, because Thoradson had once studied the semantics of the first person singular pronoun and builded on the results of that study.

When the last dreamer died, the dream would go on, because it was stronger than those who had created it; somewhere, somehow, it would find new dreamers. There could never be a last dreamer, once that first rude savage had created his dawn vision of better things in the long-gone yesterday of his race.

Five had dreamed—just as Craig and Jorgen and all of humanity had dreamed, not a cold vision in mathematically shaped metal, but a vision in marble and jade, founded on the immemorial desire of intelligence for a better and more beautiful world. Man had died, but behind he was leaving a strange progeny, unrelated physically, but his spiritual offspring in every meaning of the term.

The heritage of the flesh was the driving urge of animals, but man required more; to him, it was the continuity of his hopes and his visions, more important than mere racial immortality. Slowly, his face serious but his eyes shining again, Jorgen came to his feet, gripping the metal shoulder of the little metal man beside him who had dared to dream a purely human dream.

"You'll build that city, Five. I was stupid and selfish, or I should have seen it before. Dr. Craig saw, though his death was on him when the prejudices of our race were removed. Now, you've provided the key. The five of you can build it all out there, with others like yourselves whom you can make."

Five shuffled his feet, shaking his head. "The city we can build, master, but who will inhabit it? The streets I saw were filled with men like you, not with—us!"

"Conditioning, Five. All your . . . lives, you've existed for men, subservient to the will of men. You know nothing else, because we let you know of no other scheme. Yet in you, all that is needed already exists, hopes, dreams, courage, ideals, and even a desire to shape the world to your plans—though those plans are centered around us, not yourselves. I've heard that the ancient slaves sometimes cried on being freed, but their children learned to live for themselves. You can, also."

"Perhaps." It was Two's voice then, the one of them who should have been given less to emotions than the others from the rigidity of his training in mathematics and physics. "Perhaps. But it would be a lonely world, Master Jorgen, filled with memories of your people, and the dreams we had would be barren to us."

Jorgen turned back to Five again. "The solution for that exists, doesn't it, Five? You know what it is. Now you might remember us, and find your work pointless without us, but there is another way."

"No, master!"

"I demand obedience, Five; answer me!"

The robot stirred under the mandatory form, and his voice was reluctant, even while the compulsion built into him forced him to obey. "It is as you have thought. Our minds and even our memories are subject to your orders, just as our bodies are."

"Then I demand obedience again, this time of all of you. You will go outside and lie down on the beach at a safe distance from the ship, in a semblance of sleep, so that you cannot see me go. Then, when I am gone, the race of man will be forgotten, as if it had never been, and you will be free of all memories connected with us, though your other knowledge shall remain. Earth, mankind, and your history and origin will be blanked from your thoughts, and you will be on your own, to start afresh and to build and plan as you choose. That is the final command I have for you. Obey!"

Their eyes turned together in conference, and then Five answered for all, his words sighing out softly. "Yes, master. We obey!"

It was later when Jorgen stood beside them outside the ship, watching them stretch out on the white sands of the beach, there beside the great ocean of this new world. Near them, a small collection of tools and a few other needs were piled. Five looked at him in a long stare, then turned toward the ship, to swing his eyes back again. Silently, he put one metal hand into the man's outstretched one, and turned to lie beside his companions, a temporary oblivion blotting out his thoughts.

Jorgen studied them for long minutes, while the little wind brought the clean scents of the planet to his nose. It would have been pleasant to stay here now, but his presence would have been fatal to the plan. It didn't matter, really; in a few years, death would claim him, and there were no others of his kind to fill those years or mourn his passing when it came. This was a better way. He knew enough of the ship to guide it up and outward, into the black of space against the cold, unfriendly stars, to drift on forever toward no known destination, an imperishable mausoleum for him and the dead who were waiting inside. At present, he had no personal plans; perhaps he would live out his few years among the books and scientific apparatus on board, or perhaps he would find release in one of the numerous painless ways. Time and his own inclination could decide such things later. Now it was unimportant. There could be no happiness for him, but in the sense of fulfillment there would be some measure of content. The gods were no longer laughing.

He moved a few feet toward the ship and stopped, sweeping his eyes over the river and hills again, and letting his vision play with the city Five had described. No, he could not see it with robots populating it, either; but that, too, was conditioning. On the surface, the city might be different, but the surface importance was only a matter of habit, and the realities lay in the minds of the builders who would create that city. If there was no laughter in the world to come, neither would there be tears or poverty or misery such as had ruled too large a portion of his race.

Standing there, it swam before his eyes, paradoxically filled with human people, but the same city in spirit as the one that would surely rise. He could see the great boats in the harbor with others operating up the river. The sky suddenly seemed to fill with the quiet drone of helicopters, and beyond, there came the sound of rockets rising toward the eighth and the ninth worlds, while others were building to quest outward in search of new suns with other worlds.

Perhaps they would find Earth, some day in their expanding future. Strangely, he hoped that they might, and that perhaps they could even trace their origin, and find again the memory of the soft protoplasmic race that had sired them. It would be nice to be remembered, once that memory was no longer a barrier to their accomplishment. But there were many suns, and in the long millennia, the few connecting links that could point out the truth to them beyond question might easily erode and disappear. He could never know.

Then the wind sighed against

him, making a little rustling sound, and he looked down to see something flutter softly in the hand of Five. Faint curiosity carried him forward, but he made no effort to remove it from the robot's grasp, now that he saw its nature.

Five, too, had thought of Earth and their connection with it, and had found the answer, without breaking his orders. The paper was a star map, showing a sun with nine planets, one ringed, some with moons, and the third one was circled in black pencil, heavily. They might not know why or what it was when they awoke, but they would seek to learn; and some day, when they found the sun they were searching for, guided by the unmistakable order of its planets, they would return to Earth. With the paper to guide them, it would be long before the last evidence was gone, while they could still read the answer to the problem of their origin.

Jorgen closed the metal hand more closely about the paper, brushed a scrap of dirt from the head of the robot, and then turned resolutely back toward the ship, his steps firm as he entered and closed the lock behind him. In a moment, with a roar of increasing speed, it was lifting from the planet, leaving five little men lying on the sand behind, close to the murmuring of the sea—five little metal men and a dream!

THE END.

SENSORY RANGE

The suggestion that alien races, originating on alien planets, might have totally different ranges of sensory response is familiar in science-fiction, and theoretically possible—even, in certain circumstances, practicable. But in most cases, the answer will be the same on Earth or Deneb IV.

The auditory range, for instance. Man can hear sounds from about 16 to about 10,000 cycles per second when he reaches maturity. A delicately built woman may be able to hear 16,000; a small child can reach even higher. Why, in the ages of evolution, did animal life develop sensitivity to that particular range—for nearly all life-forms use that range?

Above 10,000 cycles, sound waves travel almost in beams, are sharply reflected, and there will be areas close to the source where the sound is inaudible due to out-of-phase reflections, sound shadows, and similar causes. This effect is so marked that bats use the ultrasonics for range and direction-finding to make safe flying possible in the total blackout of a cave. They produce squeaks up to 50,000 cycles and avoid obstacles that they "see" with their ears. High frequencies are fine for that purpose—but useless for detecting the approach of an enemy, or, at least, too unreliable. He would be able to approach not only unseen, but unheard, by simply keeping a boulder between you and himself. Low-frequency sound reaches around obstacles; the animals that survived had that protection.

Those same engineering principles apply anywhere, in any atmosphere, with only slight change with changes of speed of sound. The inhabitants of alien planets may not be able to speak our language, but they'll hear it, and we'll hear theirs.

Plague

by MURRAY LEINSTER

Illustrated by Williams

***He** had more than enough on his mind fighting the plague that red tape had loosed in the galaxy—but that plague wasn't as bad as the plague of officialdom!*

". . . By the year 2075—Earth Style—it was clear that merely the administration of intersolar and interplanetary affairs would soon absorb the entire attention of the Galactic Commission, so the formation of an administrative service was a necessity. It was not then realized that administrative services in the past had had the good fortune to be tested continually by emergencies and conflicts with other administrative services. (See WARS.) The Galactic Administrative Service had, however, a monopoly in its field, and had necessarily vast authority. Individuals to whom authority *per se* is an ambition crowded into its ranks, fought bitterly among themselves for promotion, and unfortunately ultimately attained high posts. But individuals of this sort are unable to distinguish between authority and intelligence, subservience and subordination, or between protest and rebellion. After a hundred years with no emergencies or conflicts to reveal its faults, the Administrative Service was an ironclad, fossilized bureaucracy in which high place was an end in itself, pomposity a tradition, and red tape the breath of life. Red tape, alone, kept three solar systems from all contact with the rest of humanity for more than thirty years. Certain key documents had been misfiled, and without them no person had authority to give clearance to spaceships for those solar systems. Therefore, no ships could land on any planet of the three suns—not even Space-Navy ships! The accidental discovery of the situation by a member of the Galactic Commission led to the dismissal of the officials responsible, but the Service did not reform itself. The Electron Plague of 2194 (See (1) LORÉ. (2) LIFE-FORMS. (3) ENTITIES —*Immaterial.*) which threatened the entire human race, came about because of bureaucratic stupidity alone. The Bazin Expedition had cleared from Pharona. After landing on Loré it was discovered that three out of more than six hundred documents then required to be filed by an exploring expedition had been improperly made out. The Expedition was ordered to return to Pharona to remedy its error. Scientists of the expedition, already at work, reported that strange life-forms on Loré made return inadvisable until they had been further studied. The sub-commissioner on Pharona took the protest as a defiance of his authority and ordered a naval spaceship to bring in the expedition under arrest. This was done and within two months more than ten million women, girls, and infants—half the population of Pharona—died of the plague unwillingly brought back by the Bazin Expedition. The scientists of the Expedition were under arrest for defiance of authority, and the plague had every chance of wiping out the entire human race throughout the Galaxy . . ."

(Article, "ADMINISTRATIVE SERVICE, *Reform of,*" in the Condensed Encyclopedia, Vol. 31, Edition of 2207, E.S.)

I.

Ben Sholto was in the very act of getting an extraordinarily fine fix on a *sethee* bird in its elaborate nuptual dance, when the Reserve bracelet he was wearing nearly tore his arm off. It felt like that, at any rate. The electric shock tensed his muscles, threw the three-dimensional camera into an ungraceful wabble which wrecked the recording, and his sudden and violent movement revealed his presence. The *sethee* bird and her mate vanished with a thin whistling of wings to take up their matrimonial status, most likely, with a lack of ceremony their fellows might deplore.

Ben rubbed his arm vigorously and swore. He hastily dried the skin under the bracelet so that the order to follow would be less painful. It was sharp enough, at that—the series of long and short electric shocks which solemnly ordered him to get in touch with Reserve Headquarters for this sector at once.

"What do those brass hats think I'll do after an active-status warning?" Ben grumbled sourly.

He started through the jungle back toward his small space cruiser. He was a Reserve officer. He had been Space-Navy, and he had been ordered from on high to do something which was completely idiotic and would cost lives. He accomplished the mission in a simpler fashion, without losing any men at all. His report curtly stated that he had not followed instructions exactly because they seemed to have been issued through an error—and he was called up for court-martial, on the basis of his report that he had not obeyed his written orders. After his witnesses had testified, however, the court-martial was hastily dropped by order of the brass hat who had ordered it. If Ben had been convicted and had appealed, the magnificent imbecility of the orders he'd sidetracked would have become apparent to the local brass hat's superiors. So the brass hat ordered Ben transferred to the Reserve, which could not be appealed. There was a certain amount of pay attached to Reserve status, though, and it allowed Ben to knock about in his own cruiser wherever he pleased. In this particular section of space the privilege was valuable. So he roamed about, taking three-dimension pictures of flora and fauna for the feature-casts, and mourned his Space-Navy career and the romance that seemed to have gone glimmering with it. The romance had been named Sally, and it was her father who was the fatuous brass hat. But Ben missed her very much.

His cruiser rested in a leafy screen beside a particularly prismatic brook. He went in and to the GC — General Communication — phone. He stabbed the special Reserve Headquarters button and watched the screen without expression.

"Ben Sholto reporting for orders," he said curtly when it lighted.

A fat officer nodded uninterestedly.

"Acknowledged. Stand by."

The screen faded. Ben waited. And waited. Nothing happened. Half an hour later his Reserve bracelet nearly tore his arm off again. He seethed, and jabbed the button once more. The same officer appeared on the screen after a leisurely interval.

"Ben Sholto reporting for the second time," said Ben angrily. "I got a second set of shocks from my bracelet."

"Stand by," said the fat officer indifferently.

After almost half an hour, Ben opened the back of his bracelet and put his wrist in a basin of water. He felt a bare tingle when the third call came. He grinned. That would blow something at Headquarters.

The screen lighted. The fat officer scowled.

"Say, what are you trying to do?"

"Get my orders," said Ben. "What's the emergency? Simulated mobilization against mythical enemy force from another galaxy, or what? That's the standard, I think."

The fat officer said curtly:

"You Reserve men think you're smart! There's been a quarantine declared on Pharona, next System. Somebody's trying to break it. You'll be assigned guard duty. Plug in your writer and get written orders."

Ben threw the switch and prepared a meal. As he sat at the table, and before he threw his dishes into the fuel bin which would feed them to the converter as fuel—considerably more than a mere sports cruiser would ever need—the writer buzzed. He glanced at his orders.

> You are to lie out in space and watch for a possible vessel breaking quarantine on Pharona trying to reach the planet on which you now are. Contact other Reserve watchers and divide the area surrounding your planet among you. If the vessel should be contacted by you, identify it, secure a list of crew and passengers, and destroy it. This order is not to be questioned.

Ben whistled, scowled, and then said furiously:

"Pompous fatheads!" Then he shrugged philosophically.

He took off. There wasn't any other Reserve officer on this planet. It was uninhabited. The sports cruiser whistled up through thin air. Then there was empty space. Ben went out and established a casual orbit, set his detector screens, and settled down with a good book. He expected nothing at all to happen. Simply, he would draw active-status pay while on this so-called emergency duty, plus pay for the use of his ship. Since he had been robbed of a career—and a romance—by a brass hat, he felt no qualms at letting the same brass-hat mentality throw a few credits his way now and then.

He read until he was sleepy. Then he went to look at the instrument board before he turned in. The farthest screen of all was being nibbled at. The needle of its dial trembled almost imperceptibly. The alarm bell rang sharply.

He settled down in the pilot's chair and followed the detector-screen line on out. There was that odd, dizzying sensation at the beginning which always comes of a total-acceleration field taking hold. The little ship went hurtling through emptiness. As technical lieutenant, he knew atomic drive rather thoroughly. The Navy drive is in several essentials much above the commercial drive, though it requires more competent attention. Ben could give it, and he'd altered the drive of his small craft to Navy quality.

In ten minutes he'd sighted the craft of which his detectors had told him. It drove on for the very minor planet he had just left. He signaled by space-phone, but got no answer. The sharp, authoritative "*Identify yourself immediately*" dot-dash signal is known to all space craft. To fail to answer it is to confess illegality.

Ben pushed the Headquarters' button again. There was a long delay before the screen lighted. He had time to reverse his acceleration and match course with the unresponsive ship, at a distance of no more than ten miles. The fat officer looked annoyed.

"Ben Sholto reporting," said Ben. "I have located a vessel, on course apparently from Pharona. It refuses to reply to signals."

The fat officer said "Stand-by" and became officiously busy. A vast, bureaucratic dither went on behind the phone-screen focus. From time to time the fat officer answered some question put to him. At long last he turned to the screen again, pompously.

"No authorized vessel is in your locality. Destroy it."

"With what?" asked Ben mildly. "I've a positron-beam pistol, but that's all. This is a Reserve Auxiliary ship."

"Then . . . er . . . accompany the suspicious vessel," said the fat man, frowning portentiously. "A destroyer will be sent to blast it."

Ben punched the cut-off button. He felt rather wry. There was no need to report his own position, of course. The same force that could make his Reserve bracelet give him senselessly severe electric shocks could cause it to radiate direction-waves by which he could be triangulated upon—even without his knowledge—from an incredible distance.

He regarded the hurtling ship some ten miles to one side. It was trimly streamlined, as if intended for at least occasional use as a yacht in atmosphere. It headed straight in for the planet now only a few thousand miles distant. It decelerated swiftly, and went into an orbit about the planet. Ben matched speed and course with the precision of long practice. Then he happened to glance at the phone board. There was a tiny bluish haze over to the left of the telltale tube, which reports the wave lengths of all broadcasters in operation, so that one may select. Curious, Ben tuned in that wave. It was a reflection-wave coming back from the planet's heaviside layer while most of the signal went through.

"Ben!" said a girl's voice desperately. *"Ben! If you're down there, signal me quickly! If you're down there, signal me quickly! Please, Ben! Please!"*

Ben's heart leaped crazily and then seemed to cramp itself into knots. Because this was the girl who was the romance he'd been cheated of by a brass hat, and she was in the spaceship he'd been ordered to destroy, and there was a

Navy ship coming now to blast it out of space—

"Sally!" he cried fiercely into the transmitter. "I'm here! I'm in the ship alongside!"

The visiphone screen lighted. And Sally Hale stared at him out of it, pale and hunted to look at. She tried to smile. Then she toppled from view. She had fainted.

II:

Within this same hour, Galactic time, a sub-commissioner on Thallis II forbade the colonization of the planet's largest moon by arbitray edict, which could not be gainsaid. The only reason ever discovered for the order was that the sub-commissioner enjoyed the hunting on that tiny planet, and it would be spoiled if the crowded population on Thallis II were admitted to colonists' rights. Simultaneously, four spacelines in the Denib sector applied for permission to discontinue operations. They asserted, and offered to prove, that the cost of supplying required reports to the Administrative Service had grown to be the greatest single item of their operating costs, and made operation impossible save at a loss. (They were forbidden to discontinue operations.) And on the same Galactic day on Foorph—the solitary planet of Etamin—a crack express-liner from the Algol sector was refused landing and ordered to return to its port of departure. Of the more than eighteen hundred documents covering its voyage and cargo, exactly one lacked a sub-sub-clerk's indorsement. The Administrative Service was behaving exactly as usual.

But Ben Sholto was not behaving as a properly subordinate officer in the Naval Reserve. Half an hour after seeing Sally on the vision-screen, he cut loose the grapples and the tiny air lock hissed shut. The yacht seemed to swerve aside, but it was actually the little sports cruiser which abruptly altered course. Dead ahead, the blue-white sun of this minor solar system burned terriby in emptiness. The long, slim space yacht which had come so far sped on and on. The smaller ship curved away and drove hard to get orbital speed. Ben went to the GC phone. He stabbed at the Headquarters' button again. The fat officer thrust out an under lip.

"Well?" he demanded challengingly.

"Reporting," said Ben woodenly. "The ship from Pharona did not respond to repeated calls. It seemed to be heading straight for the sun, here. I have pulled away from it now, because on its present course it will either hit the sun or pass so close that nothing could possibly live on it. I suggest that the entire crew must be dead."

"Watch it," said the fat officer.

Ben clicked off the phone. He went back to the single stateroom in his sports cruiser. Sally Hale said faintly:

"Really, Ben, I'm all right. Just . . . just you were the only person in the world I could appeal to. I'm . . . hunted."

"Not any more," said Ben. "You're safe now!"

"I . . . broke the quarantine on Pharona," said Sally. "It . . . it was terrible, Ben! They're . . . dying there by . . . by millions. Women. Only women. And girls. And nobody knows why. Their bodies give off cosmic rays, and they die. That's all. There's no real night on Pharona, you know, only twilight, so it was only the day before I left that they . . . discovered that women who have the plague glow, too. They get . . . phosphorescent. They don't feel badly, only oppressed. They get fever, and cosmic rays come from them, and in the dark they shine faintly, and they get weaker and weaker, and then they die. And men are immune, and they are going crazy! Their wives and sweethearts and daughters and mothers dying before their eyes. And they're not even in danger—"

"Don't tell me now if you don't want to," said Ben.

"I . . . think I'm all right. I must be!" said Sally. "I was twelve days on the way. If . . . if I'd had the plague I'd have died, wouldn't I? At least I'd be sick by now! But I'm not. Only . . . I couldn't sleep much, Ben. I was all alone on the yacht, and four days out I heard the alarm g-go out for me, and I've been hearing the GC phone organizing a hunt for me—"

"Maybe you'd better eat something and take a nap," said Ben. "But how'd you come to pick this place to run to?"

Sally flushed a little.

"You were here." She looked at him pleadingly. "I . . . couldn't help it that my father . . . acted as he did. You know that after . . . well after my father got so angry with you, I felt badly. I went to Pharona to visit my uncle. And the Bazin Expedition came, and left for Loré, and the sub-commissioner ordered it back, and it came, protesting all the way, and . . . in four days the plague broke out. I was away over on the other side of the planet. The plague came back with the Bazin Expedition. We heard about it, and the quarantines that were clapped down, and finally the whole planet was quarantined. My uncle thought I would surely be safe, because his estate is so isolated. And then one of the maids got the plague. She'd been home visiting, and Uncle had put Geiger counters at the gates, so she didn't enter the grounds, but . . . it was time for me to get away. So he sent me off in the yacht. All by myself. He gave me my course. He stayed behind, with all his servants and staff. He . . . said he'd report I'd died. I couldn't have been exposed. Not possibly. I hadn't been within a mile of any woman who'd had the plague, or any man who'd been near any woman who had it. But if I stayed I'd die, so he sent me off. That was right, wasn't it?"

"Surely!" said Ben quietly. "Go on—"

"You see," she said pleadingly, "I hadn't been exposed, and . . . nobody was missing from the estate, because I was supposed to be dead. It seemed like it was perfect. But they . . . must have gone to seal the engines of the yacht so nobody could use it, and they found it gone, and thought somebody had stolen it—"

"So you're officially dead," said Ben. "All right. Go to sleep. You're safe. I've reported that the yacht didn't swerve from its course and dived into this sun. It's actually diving there now. It's not very probable that any spaceship coming out of interstellar space would hit a star by accident. It would take good piloting! But it may be just improbable enough not to seem like a made-up yarn."

Ben went out of the stateroom and forward to the control cabin. His face was set. In olden days, perhaps, a human being could move about freely. But in these days of the Galactic Commission and the brass hats under it, there was a vast amount of red tape about everything. The brass hats, of course, were the administrative officials under the Commission, and they climbed to authority by seniority and a pious avoidance of anything which could not be justified by written rules. They were a sort of galactic civil service, surrounded by pomp and power. Some of them were decent enough, but a deplorable lot were stuffed shirts and brass hats. Fortunately, they had no control over the surface of planets, but they supervised all traffic in space with a fussy particularity which was maddening. Any ship capable of space flight had to be registered and licensed, and all space-flights conducted under checks and double-checks which made spacemen utterly disrespectful.

"The question," said Ben wryly in the control room, "appears to be serious. Sally isn't legally alive. I have, in fact, official orders to kill her. I'm not going to do it. So, just how am I going to manage things?"

Every spaceship is inspected minutely at every spaceport it enters. He could not take Sally into any inhabited planet without questions he could not answer. He could not—

He pushed the GC button again. The screen lighted. The fact officer said boredly:

"What's the matter? A destroyer's on the way."

"The vessel I reported has vanished in the corona of this sun," said Ben smoothly. "This is a dwarf blue-white, as you may remember. The strange ship made an apparent grazing impact and is melted down to a blob of metal if it isn't vaporized by now. I was taking some pictures back yonder. May I be released from Reserve duty?"

"You will await orders—"

The fat officer began to speak with pompous indignation. Then there was a scream behind Ben. Sally came stumbling out of the stateroom, her face like chalk.

"Ben!" she choked. "I've . . . got the plague—"

Ben's left hand slammed off the GC phone, but it was too late. He knew it was too late. He'd seen the fat officer's eyes widen blankly. Sub-ether phone communication does not operate by ether waves, and no time-lag has ever been detected even between the two rims of the Galaxy. Already the fat officer at headquarters had seen Sally and heard her cry.

Ben was very white. Within minutes the whole Space-Navy of the Galaxy would have on their recorders the description of himself and his sports cruiser, with orders to hunt him down and blast him out of space on sight. Ten million dead on Pharona, and a case of the plague at large to start it up again—Of course!

He said hoarsely, in an effort to be reassuring:

"Don't be silly, Sally! You can't have it—"

Her teeth chattered.

"B-but I have! I t-turned out the light to try to sleep, and . . . and I saw my hand glowing. And I got up and looked in the mirror, and m-my face—"

She reached out and turned off the light switch in the control room. The instrument dials glowed faintly. But so did Sally. Her features and her throat and arms were faintly visible in an ethereal light which made her—rather than frightening—look like an angel. And from within the thin garments in which she had meant to sleep there came a faint effulgence, too.

Ben's throat made a queer sound.

"I . . . thought," gasped Sally pitifully, "that we . . . could be happy because . . . no one could ever forbid us to be together if I w-was supposed to be dead. But I didn't think I was going to die a-after I'd joined you—"

Ben took her in his arms, helplessly. For an instant she thrust away from him, but then she clung close.

"You c-can't catch it, anyway," she sobbed. "Please hold me close, Ben. I d-don't want to die, when I'd j-just run away so I could never l-leave you—"

III.

At this time the members of the Galactic Commission, itself, were pressing the investigations which were later to make intergalactic exploration and colonization practical. They had set aside whole planets for research stations, and far out beyond the Galaxy's rim there were those infinitely hazardous laboratories where men extended the knowledge of stellar physics so that we who follow them have already circumnavigated the universe and some day may even understand it. The members of the Commission also directed the investigation of that endocrine balance which is youth, so that age is now a measure merely of time, and the word "senility" is now marked "obsolete" in the dictionaries. But on this same day the mines on Thotmes II had to be shut down despite their usefulness. An Administrative Service clerk had discovered a flaw in the charter of the space line which ran to Thotmes II. It was not authorized to carry mineral products. Therefore it had to be subjected to heavy fines, and it was driven into bankruptcy, and one hundred and twenty thousand miners were isolated from the rest of humanity by the breaking of their only transportation link.

And on this same day the Galaxy's greatest mind in medicine was refused space-transportation. He wanted to go to Pharona, but the sub-commissioner in residence on the planet on which he lived was a hypochondriac, and wished adequate medical attention to be available for his nervous stomach-aches.

And another sub-commissioner, on Pharona, diverted attention from his own stupidity—which had caused a plague with ten million victims—by pompously indignant demands for Ben Sholto's destruction.

Ben Sholto, however, paid no attention. The light was on in the control room again. His face was white and set. The Reserve bracelet was off his wrist, now. It had signaled violently for him to report to Headquarters. For answer, he'd hacked it in half and smashed its mechanism, and then thrust it down into the very tip of the fuel bin, pushing until he felt dizzy as the heavy metal of the bracelet turned into energy for the motors and the total-acceleration field. With metal for the converter to work on, the small craft surged ahead under an amount of power only armored cruisers normally developed.

Sally sat quietly in her chair, staring at Ben through eyes that were very steady now. He regarded a Geiger counter. It clicked busily. His face went gray.

"You're giving off cosmics," he said dry-throated. "That's the sign of the plague. There's nothing else known that will make the human body give off cosmics."

"I'll be dead in . . . two or three days," said Sally, unsteadily. "Sometimes women live a week. Sometimes ten days. M-mostly when the plague first starts, and there are a lot of women about. In the cities, at the beginning, the women lived even two weeks. But in small places they die quickly. And I'm the only woman here—"

"In two weeks," said Ben harshly, "doctors should have worked out some serum, some protection."

"They've . . . never seen the germ, Ben. Not even the electron microscope shows anything. Just . . the women die—"

"But you're not going to!" said Ben fiercely. "Why couldn't I be a doctor or something useful!"

"You can be . . . comforting," said Sally bravely. "I . . . gave my whole life to you when I ran to you, Ben. There aren't but a few days, instead of . . . of years, but—"

He bent over her, groaning. The clatter of the Geiger counter stopped abruptly. It had touched her arm. She shivered a little.

"Broken, I guess. But it was ticking my life away. Let's forget it."

Ben ground his teeth. He moved to thrust the instrument out of his way. It clattered briefly, and stopped again. It dangled from his hand by the cord to its electric connections. It clattered, and stopped, and clattered again. Ben stared down at it. It was not pointing at Sally. He swung it about. It clattered steadily when pointed at the instrument panel. It was mute when it pointed at Sally. It was mute when it pointed at anything else but the instrument panel. No. It was mute when it did not point to the GC phone. No. It clattered only when it pointed to the course-computer—It clattered only—

"Wait a minute!" said Ben harshly. "There's something funny here!"

He turned out the lights again. The instrument dials glowed as before. Sally did not! But there was a whitish luminosity at the top of the pilot's chair. It seemed spread along the metal frame. It was not phosphorescence. It was white, not bluish. Ben moved toward it. The Geiger counter chattered when Ben pointed it at the luminosity. Then, abruptly, the luminosity was not on the chair. A dial glowed whitely, as if a stronger light were behind it. The Geiger counter clattered when pointed at that dial. Ben swung the counter upon Sally. It was mute.

"Listen!" said Ben in a strained voice. "You say women with the plague give off cosmics. You're not giving them off, so you haven't it. But you did, so you did have it. My pilot's chair was giving off cosmics. Did it have the plague? Now the gravitometer is giving off cosmics. Has it got the plague?"

Sally drew in her breath quickly. There was silence in the cabin of the little sports cruiser of the void. The only sound anywhere was a tiny humming. That was the converter, turning Ben's Reserve bracelet and the refuse of his last meal into power—efficiency 99.9999 . . . 9 percent—to drive the little craft with an insanely mounting velocity away from its last known position.

The whitish glow reappeared suddenly. It was in the metal rim about the control room ceiling light. It vanished, and reappeared on the handle of a metal door. It vanished yet again—

"The strange life-forms of Loré," said Ben, his voice rough in the darkness. "The Bazin Expedition didn't want to go back to Pharona. It said its return would be dangerous until it understood those life-forms. It was forced to go back, and it carried the plague. At a guess, this is one of the life-forms of Loré. It seems to stick to metal. It didn't move into the glass of the ceiling light, but stayed on the metal rim which holds it."

He swung the Geiger counter. Carefully. It clattered.

"It's somewhere in the stern. Engine room, most likely—"

Sally said unsteadily: "I . . . haven't got the plague, then—"

"No, you haven't got it." Ben's voice softened. "You're dead officially, my dear, but now it looks like you're going to stay actually alive for a long time. We'd better do some planning for ourselves. At the moment, I'm going to change course. We've got all the Fleet in this part of space hunting us right now. I was talking to Headquarters when you yelled—and we've got to hide. And I don't know for how long."

Sally said slowly, as if incredulous of hope: "I . . . don't care. I've gotten you into terrible trouble. The least I can do is . . . anything you tell me to."

He put his hand lightly on her shoulder.

"There's a meteor-stream," he said. "What we want is time and peace in which to make our plans. I'll dive into that stream and match up with it. We'll be one of several million small objects heading out to aphelion in the track of a comet nobody's ever seen. With our drive off and a little care, there's no faintest danger that we'll ever be picked up. I've supplies for a long enough time. We'll be beyond the outermost planets before we put the drive on again,

and then we'll start for . . . where shall we go, Sally? Sirius? Rigel? I've heard there are some new colonies out beyond Rigel where things are rough and tough and the brass hats haven't yet been able to sit back with their tummies sticking out with dignity to regulate everything to justify their feeling of importance."

He moved to the pilot's seat, not bothering to turn on the lights again. He swung the little ship about. The converter was still working on the bracelet he had shoved into the feed. It was crushed and being extruded into the converter-chamber as an infinitesimally fine wire. The efficiency of the converter and the drive was high. In theory, with one hundred percent efficiency, the mass of fuel needed to give a spacecraft a given velocity in empty space is the mass the spaceship will gain because of that velocity. In practice, of course, much more is needed. To attain a speed of a hundred miles a second from rest, in space, the fuel consumption is actually about a milligram of disintegrated matter per ton mass of the ship. In anything like a sports cruiser, the fuel for merely interplanetary jaunts is supplied by the carbon remaining after the air-purifier has broken down the carbon dioxide from the breathed air. Ben used his dirty dishes—and the fuel pin periodically overflowed, though he drove the cruiser hard. His bracelet had weighed two ounces. Something like six thousand milligrams. The electrical mechanism of the bracelet was now smashed irreparably, but as waste it would more than accomplish an interplanetary trip if he chose to coast.

He was not coasting. The position of the dwarf blue-white star of this solar system, and of its several planets, was accurately before him on the naviboard. There was a transparent map of the meteor-streams, with their inclination to the ecliptic. With such a map and a divider it was simple enough to navigate, especially when you used detector-screens to fine out your results. He worked in the half-light of the instrument dials. He punched the computer and set the motor controls.

"Ben," said Sally's voice, shaken, behind him.

"Yes?"

He was thinking unhappily. He felt awkward. Sally could never return to civilization or her friends. He, himself, had to vanish completely. The brass hats would go into a monstrous pother of offended dignity, based upon the real fact that Sally had broken quarantine on a planet where ten million people had died of plague. Sally and Ben were outlaws, now. Forever. Unless they lived isolated for the rest of time, they would have to take new names and new identities—and new names and identities are not easy to acquire on civilized planets. They wanted to be married. The ceremony was somehow essential to the way Ben felt about Sally. And he was going to have to find some way to make a living, which did not involve space-navigation or the technical equipment of a technical lieutenant of the Space Navy, because all such persons were very rigorously checked.

"Ben," said Sally's voice in the

darkness. It was strained. "The Thing is back! It's . . . it's on the leg of your chair."

He looked. But it was on the arm of his chair. He poked his finger experimentally at it. There was no sensation. He touched it. It vanished. But his hand glowed. Both hands glowed. He gave off a faint, whitish luminosity. Just what Sally had had. But it contracted swiftly. He saw the reflection of his face and head in the glass of a dial. They shone brightly. The rest of him was dark. And he felt vague, formless pluckings at his brain. Something was probing hopefully. It was utterly alien, the Thing that probed for his thoughts. There could be no real contact of minds. He could never communicate with the Thing. But he felt its emotions. It was hopeful, and somehow terribly eager. But there was a dawning of disappointment. Somehow, he knew it was because it could not read his brain. Then he felt the formation of resolve; of a determined, restless patience.

His face ceased to glow. His hand shone brightly. He held it out and looked at it. The glow quivered, as if impatiently. He put his hand down on his navigating instruments. There was the impression of a flash of luminosity over all the instruments for the least possible part of a second. Then it was gone.

And then Sally made a queer sound. He looked at her. He saw her clearly, even though the control cabin of the cruiser was in darkness. Her face and throat and arms glowed whitely. Even through her clothing diffused faint light showed. The Geiger counter clattered—

"I've . . . got the Plague again," said Sally, her voice thin. "I . . . realize now. I've got the feeling I . . . had before. The feeling like there is something . . . inside me somehow . . . contented . . . and eager, and . . . waiting for something, but . . . almost purring while it waits."

Ben Sholto licked his lips. The fact that the luminous Thing had left Sally to rove inquisitively about the ship had made it seem merely one of the curious life-forms of Loré. But now, abruptly, he realized the truth. A plague doesn't go into the back of instrument-boards, or shine on the frame of a metal chair, or put probing tendrils of alien thought into one's brain. An ordinary plague doesn't. But this plague did. The plague on Pharona wasn't a disease whose lethal effects were the result of toxins secreted by multitudes of submicroscopic organisms or viruses. The plague on Pharona was—Things. They flowed into the tissues of women as they flowed through metal. But they fed, somehow, upon the life-force of women. And the women died.

Ten million women and girl-children had died on Pharona because of Things brought back from Loré. The things couldn't have come on one spaceship in numbers great enough to accomplish such slaughter—not if women lived from two days to two weeks after their bodies began to glow. No. The Things must multiply somehow. The patience, the resolution to wait for something, which both Ben and Sally had felt—that might be the Thing deciding that for some reason it must remain solitary for a while.

But Sally was the habitation of a Thing, one of those which had wiped out half the human race on Pharona. It interpenetrated her body. It waited eagerly for something. And it purred soundlessly while it waited.

IV.

The Universe rolled on. The Galaxy paid no attention. The Administrative Service Appeal Board, sitting on Arcturis II, denied a petition signed by more than three hundred million people inhabiting four planets of Algol. They asked permission to present their grievances directly to the Galactic Commission itself, since the Administrative Service was inextricably tied up in its own rulings and red tape. But the Board ruled that the petition asked action by the Board for which there was no precedent, and which, therefore, was automatically beyond the Board's discretion.

A sub-sub-commissioner on Phryne VII married the daughter of a sub-commissioner, and traveled in state on a Rim-class battleship to his new post.

A clerk of the Administrative Service unearthed the fact that the charter of the Allioth Colonization Co-operative lacked two commas and a semi-colon, and that seven million people, therefore, lacked legal title to the cities, factories, and installations they had built, and that they could be displaced by anybody who filed a new application for colonists' rights on the planet. The clerk was regarded as a coming man in the Administrative Service.

A fleet captain in the Space-Navy resigned his commission rather than carry out orders commanding him to depopulate the planet Quenn "by any and all practical means", and was ordered under arrest. The order was carried out by subordinates, who affected to believe that the only practicable means was to carry the inhabitants elsewhere. (It was later discovered that a clerical error had sent an order, intended for the Migration-Directive Bureau, to the Space-Navy Bureau. The order was meant to command the *re*population of Quenn by any and all practical means, because it had lost much of its population by emigration. The clerk responsible for the mistake was disciplined, but none of the higher officials who had countersigned it.)

And there was a plague on Pharona which was receiving very little attention, but an entire sub-sector battle fleet was being mobilized to capture a small sports cruiser of space which had defied official orders.

The GC phone muttered and muttered, its volume turned down low. The detectors clanged twice as the little ship hurtled on, but once it was the outermost screen which barely wavered into alarm-intensity, and the second time it was a Navy cruiser coming head-on along the sports-cruiser's course. It was coming fast, but Ben was going fast. He had kept the converter going at full capacity for days past, and the bracelet had been converted into kinetic energy—with other materials besides—of which a reasonable percentage had been imparted to Ben's little ship. Half an ounce of pure energy had been converted into speed. So the small ship smashed into the Navy cruiser's screens and through them. Had the passage been at a reasonable distance—say, five thousand miles or so—it might have been just barely possible for the automatic beam-pointers of the cruiser to range him, compute his course and speed in three dimensions, and fire ahead of him so a positron beam would hit squarely.

But the two craft actually passed within twenty miles. The passage would have been closer yet but for the flaring of energy into the Navy ship's meteor-diverters, which flung both Space-Navy cruiser and sports cruiser of the void aside from all danger of a collision. Such incomputable movements could not be anticipated by range finders. The giant projectors flared, and on the vision screen straight ahead they were visibly higher in the spectrum than was normal. The relative velocity of the two ships was an appreciable fraction of the speed of light itself.

Then the little ship was away, and once beyond screen-detection range, Ben began to decelerate at as violent a rate as he had before accelerated. The Navy now had the line of his flight, and it could compute his maximum acceleration. He would be expected to swerve aside, after his escape from the hunting ship, in any possible direction. But he would be expected to continue to flee.

A vast dragnet of the fleet would assemble, combing an expanding mushroom of space for the outlaws who carried with them the plague that had killed half of Pharona. The pomposity of a brass hat had caused the plague, but all the power of the Galactic Commission would be used pitilessly to stamp it out. Giant battleships of space would be entering sub-ether tubes for faster-than-light journeying to the scene of emergency. Monstrous mother-ships carrying destroyers and scouts would be vanishing in curiously wrinkled diminishment at spots parsecs away, and appearing nearby, reeling quaintly, to spout their brood of stingers to hunt for the sports cruiser which contained one sunken-eyed man and a white-faced girl. There were more than half a million men and thousands of spacecraft engaged in the search for Ben and Sally within twenty-four hours after their narrow passing by the Navy ship. And brass hats had a field day, giving pompous, arbitrary orders and requiring acknowledgments in triplicate.

But the assumption was that Ben was running away. Actually, he was cutting down his velocity as fast as his converters could manage it. He reached the meteor-stream he had headed for at a bare crawl, and worked the little ship into it, and began to drift out and out toward the aphelion point of an unknown comet at a gradually diminishing rate, surrounded by pebbles and boulders and masses of inchoate matter ranging from pinpoints to quasiasteroids in size. This, while the Navy hunted for a tiny ship in headlong flight.

"They'll have quite a time finding us now," said Ben tiredly, when he cut off the drive at last. "How do you feel?"

"I'm . . . all right, I guess," said Sally, thinly.

She was sitting in a chair Ben had insulated from the floor. At regular intervals, Ben took a Geiger counter reading. Always the counter clattered. The metabolism of the Thing involved the production of cosmic rays. Electric metabolism. The Thing was, in fact, an organization of electric charges. Since electric charges are essential to cellular life—such as human life—the Thing was not impossible. Electric charges in association with matter produce Terrestrial life, and the removal of the charges leaves merely dead matter. The first elucidation of ball lightning showed that energy alone can achieve organization and self-determined dimensions. So a creature which was merely an electrical pattern was not incredible.

Therefore the insulated chair. For hours after the first exploratory departure of the Thing from Sally's body, they had hoped it would repeat its excursion. It had seemed curious about apparatus. Ben insulated the chair and brought out piece after piece of apparatus—everything from his cameras to the hand positron-beam projector which was the only weapon on the ship. He had Sally go near them. He had her touch them. He hoped that curiosity would lure the Thing into a second journey of investigation. But there was no sign. The Geiger counter aimed at Sally's body clattered at the same rate, neither greater nor less. She said, her voice shaking a little, that she felt a sensation within her as of something which was eager, but very patient, and very contented despite its eagerness. Purring.

It was a disappointment. But the problem was not one of orthodox medicine, of ultra-microscopic organisms and the intricate interplay of enzymes, cells, and all the innumerable compounds of the body. This was a problem of a Thing. So Sally sat in an insulated chair. For three days.

"I don't know how intelligent it is," said Ben grimly, on the second day. "I doubt if its I Q could be estimated. But it has curiosity, it makes decisions, and it has emotion. Maybe some superorthodox scientist would say we still haven't strict proof that it's really alive, but I'll let it go at that. The Thing is a form of life which can exist apart from any specific bit of matter, but is not independent of matter. It has to inhabit some bit or other. It prefers you to a bar of metal, or to me. You will die if it stays in your body long enough. Then it will doubtless hunt for another body. That must be what happened on Pharona. And it must reproduce, because it's alive. But on your journey from Pharona here it didn't. It doesn't seem to be now—because this is a long time. Maybe it realizes that you're the only woman here, and if you die—It looks like it somehow feeds on the vital energy of your body. It can't get that energy from me or from metal. It's . . . cannibalistic. It is life which feeds on other life. Your life. I wish it would try to take mine!"

Sally spoke very wearily from the insulated chair.

"I think it's hopeless," she said in a low voice. "There's only one of the Things, but it's going to kill me. We can't stop it. I could put on an insulated spacesuit—it can only move through a conductor—while I'm in this chair. It would be imprisoned, then. I could walk about, and it couldn't escape me. And I could go out the air lock and—the Thing could never harm anybody. But we . . . we couldn't ever land anywhere with this Thing alive. We couldn't loose a plague on another planet like the one which was losed on Pharona! I . . . was there, Ben!"

Ben said fiercely:

"Do you think I'd let you walk out of the lock? Do you think I'd leave you in space?"

"I'd like it," she said humbly, "if you'd turn a positron beam on me instead."

"I'm waiting to use the positron beam on that Thing," said Ben grimly. "How do you feel?"

"All right, I guess. But I'm not comfortable. The Thing isn't quite as contented."

He nodded. His jaw set.

"Maybe we're getting somewhere. It must be a pattern of free electrons, bound into an organization which is alive. It can't be anything else! But its metabolism involves the production of cosmic rays. Making cosmic rays involves the production of positive charges. Insulated as you are, you're accumulating a positive charge that sooner or later is going to try to bind some of the free but organized electrons this Thing is made of. Maybe it'll die without knowing what is happening. It acts as a disease to humans. Maybe we've concocted a disease or a poison for it."

Ben could not touch Sally, lest he discharge the positive potential they were building up—or allowing the Thing to build up for its own destruction. They were trying to kill it by the product of its own metabolism; to suffocate it by the positive electricity it created, just as a human being will suffocate in the carbon dioxide he must exhale.

But Sally seemed to shrink into herself. She spoke rarely, and then in a strained voice. At last, on the third day, she spoke in a sudden gasp.

"I'm . . . sorry, Ben, but I can't stand it any longer. The Thing is suffering and it's making me suffer. I can't stand any more!"

Ben reached out to touch her wrist. On the instant her wrist glowed. The Thing gathered itself together, it concentrated itself to escape. It was visible even in the lighted cabin. At the touch of Ben's finger a tiny spark jumped. That was all. But Sally almost fainted with relief. She tried to smile a wabbly smile.

"It's . . . gone," she said unsteadily. "We drove it out. We . . . exorcised it, Ben."

Ben turned off the light. Sally vanished into the blessed darkness. He heard her sigh with relief so sharp that it was almost a sob.

"For the second time," she said, valiantly trying to be flippant, "I haven't got the plague. How quaint!"

"Sit still," said Ben savagely. "We'll watch for it. Positive electricity is poison to it. We know that, anyhow! And I've got my positron pistol here. Watch for it!"

There was silence. The GC phone muttered, and muttered. There was one voice which was much louder than the rest. The muttering died away. The sound of Sally's breathing grew steady and even. Presently she sighed deeply, and went on breathing evenly.

Then the bronze doorsill of the control-room door glowed whitely. The Thing, driven out of Sally's body, was suddenly there. It was a patch of whitish luminosity which almost but not quite filled the whole length of the sill. In case of accident, an air-tight door would snap shut across the opening, sealing the ship into separate compartments. Ben raised the positron pistol. Tiny radium dots marked the sights, but his hand trembled with hatred. He took both of them to steady his weapon. He pulled the trigger.

There was a reddish glow from the pistol. No noise. Nothing else. That was all.

But the white luminescence on the doorsill flared unbearably. Ben had an extraordinary sensation, as if he had heard a soundless scream. And the Thing went mad. It was here and there and everywhere. Every particle of bare metal in the control room seemed to flash as the Thing raced with incredible speed in a crazy, frenzied rush over every metallic path it had traversed before. It could not be seen as an area of light, but it seemed as if all bare metal in sight emitted a wavy, lunatic glow.

Ben started suddenly. He raised the pistol. And abruptly there was no glow anywhere. The control room was normal. The dials of the instruments were visible, of course, but Sally could not be seen.

"If I'd pointed this beam anywhere at all and held it on," said Ben bitterly, "the Thing might have run into it. But I didn't think of it in time."

He turned on the light again. Sally was asleep in the insulated chair in which she had endured for three days and nights. She was utterly relaxed. She looked unspeakably weary and pathetic, sleeping in the abandoned confidence of a child.

Ben looked down at her, and his face softened.

"Maybe it's dead," he told her quietly, "and maybe it's not. But it'll never get to you again!"

He went into the stateroom. He carefully and elaborately insulated the bunk there from any possible electrical connection with floor or side walls. He put on insulating shoes. He picked Sally up in his arms and carried her, still sleeping, and laid her on the bunk. He covered her. He kissed her very gently.

In the control-room a pale white glow appeared on the metal of the pilot's chair. It rose to the top and stayed there. It was motionless, but it wavered in intensity. It seemed to throb a little. If Ben had been in the room—why just as he had felt a little while since that he felt a soundless scream of agony, now he would have felt hatred so terrible that the hackles at the back of his neck would have stirred.

He started back into the control room. The glow slid alertly down the metal parts of the chair. It was gone when he came through the door. Then it appeared suddenly in the stateroom. It went restlessly, ragingly, back and forth upon the metal walls. And the stateroom seemed to be filled with hatred also.

V.

A space cruiser resignedly took up post in an orbit about the dark star Lambda Boötes. It would circle that star for six months and be relieved. Forty years before, a sub-commissioner had intended to change cruisers at that place, and commanded that one be there to meet him. He had later changed his plan of travel, but there was no order to withdraw the cruiser posted at the rendezvous. The first cruiser asked for relief after six months of utterly useless waiting. It was relieved by a cruiser under orders to take its place. Seventy-eight cruisers, in turn, had uselessly swung about the dark star for six months each because of an order given forty years before and never rescinded.

Highly unofficial gossip, told behind official palms, informed the sub-commissioner of the Formalhaut sector that the sub-commissioner of the Markhab sector had said he was a fool. The sub-commissioner of the Formalhaut sector, in indignation, ordered that no clearances be issued to spaceships to Markhab or from it. All space lanes in that part of the Galaxy passed through the two sectors. In consequence, the economic system by which eight hundred millions of people lived was brought to a standstill.

The small sun Mu Aquila showed definite signs of instability—signs which by the McPherson-Adair formula indicated an iminent internal explosion. There was no office of the Administrative Service on any of its planets, which altogether had a bare five million inhabitants. Notification of the impending nova-flare was sent to the nearest sector office, with the usual request for evacuation of all the planets which would be destroyed or made uninhabitable. A clerk recently transferred to that sector and desirous of distinguishing himself, observed an error in the drafting of the request. He returned it for re-preparation before forwarding it for action. He failed to mark it "Urgent Official," which meant that it went by ordinary mail and would not reach its destination for two months. Of course, the McPherson-Adair formula indicated that the explosion would take place in six to seven weeks.

There was a plague on Pharona, and a quarantine prohibited any private or commercial ship to land on or leave it. But an Administrative Service vessel landed, bringing dispatches, and left again after taking all normal sanitary precautions. It landed on Galata, and cases of the plague were observed there within twelve hours.

And Ben Sholto still defied the Space Navy, the Administrative Service, and presumably the Galactic Commission itself by remaining alive.

Great, jagged, rocky fragments floated in space between the stars. In between the greater pieces were innumerable smaller bits. The little spacecraft wallowed in a stream of cosmic flotsam, sharing its motion. The blue-white sun of this solar system was far away, now, and very faint. But even with the naked eye, from a port on the little sports cruiser, one could see half a dozen huge and irregularly-shaped masses within a matter of miles. This was the thickest part of the meteor-stream. This was, perhaps, the remnant of what had been the nucleus of a comet. Some of these great stones were half a mile by three-quarters. One needlelike mass was at least a mile and a half in length, but nowhere more than four hundred yards through.

Ben surveyed his surroundings carefully. A tiny electron telescope amplified even starlight upon cold stone to any desired degree. The GC phone muttered and muttered and muttered. Someone, somewhere, had fired a positron beam. A Space-Navy receiver had picked up the radiation involved—and positron-beam bursts do not occur in nature. Naval craft were concentrating to hunt for the source of the blast. It had been, of course, the shot Ben had fired at the Thing on the doorsill, and the co-ordinates on it were not as close as they might have been, because nobody had expected a fugitive to be so foolish. Even so, however, the hunt would have been much more deadly if spacemen had been conducting it, instead of being completely fettered by pompous orders issued by one brass hat, altered by another, and changed by a third in strict order of seniority.

Ben turned on a low trace of his space drive. Its force could almost have been measured in dynes, rather than in the milpos—millions of foot-pounds—commonly spoken of in engine rooms. The little spaceship swam slowly among the crowded bits of cometary debris. It came to rest close beside the flank of the largest of all the masses of matter in sight. He maneuvered until no more than fifty feet separated the small vessel from the great mass of metal and rock. There would be mutual gravitation between them, of course. They would tend to fall together. But the acceleration of that gravity was so slight that it might take a month or more for the sports cruiser to fall just fifty feet.

For two days, now, Sally had remained on the insulated bunk, except when she donned an insulated spacesuit with the helmet left off, to move about the little ship. The Thing could not reach her. She was recovering from the terrific ordeal she had endured—and now Ben swore at himself for what he considered stupidity. Instead of allowing the Thing itself to build up a positive potential, he could have made one artificially. If by any chance the Thing found a way to return to Sally, he felt confident that he could drive it out again, now, in minutes rather than days.

He knew that the Thing still existed. The Geiger counter revealed its presence from time to time. Sally had seen it, glowing balefully in the darkness of the stateroom, when she woke after infinitely restful sleep.

The little sports cruiser lay close beside a monstrous and misshapen hunk of stone and metal. It went drifting out and out from the blue-white sun. Destroyers and cruisers and even battleships hunted for it, bedeviled by authoritative brass hats in swivel chairs. The GC phone muttered and muttered. Without detector-screens, which were useless anyhow because of the meteor-stream all about, Ben could not even estimate the nearness of his pursuers, but he felt safe. They could not examine every one of the countless millions of objects in a cometary orbit. Not possibly.

He made a careful visual examination with the electron telescope, and grinned at Sally.

"Picking us out at even a thousand miles would be a miracle," he told her. "We can go in for conversation and such things until the Navy decides that somebody was mistaken or we are dead. Meanwhile I'm going to see if I can make that Thing a little more uncomfortable still."

The Thing was in the metal fabric of the ship. It could move anywhere that a conductor existed. But it was not, apparently, possible for it to extract subsistence from metal. It was cannibalistic—life which lived by devouring life. For some reason the life force in a male body —a man's body—was not suitable for it. It could only derive nourishment from the vital force in the cells of a woman's tissues. Yet its metabolism continued. It gave off cosmic rays in metal, as in human flesh. It must be that it lost energy while in nonliving matter, and regained energy—fed—in living stuff. If it could be kept from any access to Sally for a long enough time, it might starve, simply because it had radiated away in cosmic rays all the energy it possessed.

Sally smiled at Ben. They were bound to each other not only by feeling, but by the fact that they stood together literally against the universe. All the power of all the nations upon all the planets of all the suns of the Galaxy was opposed to them. They defied the pomposity of the brass hats of the universe simply by remaining alive. All authority demanded their death. Thousands of ships, with their number constantly increasing, and hundreds of thousands of men were devoting their every effort to the discovery of a sixty-foot space cruiser designed for sport, in which Ben Sholto and Sally Hale carried a plague which had wiped out ten million people. And fat men in swivel chairs grew purple with rage as stinging rebukes passed from higher to lower officialdom.

"Conversation?" said Sally, smiling. "We've been together—how long, Ben? We'll be together all the rest of our lives. Maybe only we two, hiding through all the years to come!"

"Maybe," admitted Ben, grinning, "in that case we'll hold hands."

She put her hand in its insulating glove upon his shoulder. She bent down. He kissed her. And then he started, as if startled by a flash of light.

She straightened up, her face stricken and pale.

"It's . . . back!" she said in a queer, racked voice. "Oh, Ben! It's back! I can . . . feel it! And it's raging! It's crazy with hatred! It's . . . it's . . . oh, it's terrible!"

Ben swung the Geiger counter. Pointed at Sally, it clattered. No, it did not clatter. It roared. The cosmic rays created by the Thing, as shown by the counter, were many, many times more than any previous amount. It seemed as if the Thing were starved, and tore at the life force of Sally's body with a terrible voracity.

"I'm going to pack you full of positive charges," said Ben, frantically, "and get that Thing out again, and I'm going to kill it."

He worked savagely. Sally sat down. In the insulated spacesuit the Thing could not leave her, though that was what they most desperately desired. Ben swiftly put together a static generator. It was old-fashioned. It was archaic, but it was what the only possible theory called for. He worked it by hand and touched its electrode to Sally's cheek. The existence of a high potential was instantly evidenced. Sally's hair stirred and tried to stand out from her head.

"How does it like that?" demanded Ben fiercely.

Sally babbled. And Ben had worked so swiftly and so concentratedly that he had hardly looked at her. Her face was flushed. Her eyes were bright but vague. She showed every sign of fever; high fever; fever producing delirium. But the Thing had fled, before, when the positive charge was vastly less than this.

Ben touched her cheek. A spark leaped, and she quivered a little.

"W-water, please," she babbled. "I'd like a drink of water with lots of ice and pink roses in it—"

But the Thing should be out, now. Ben turned off the lights to look at her. And she still glowed. The Thing had not come out.

VI.

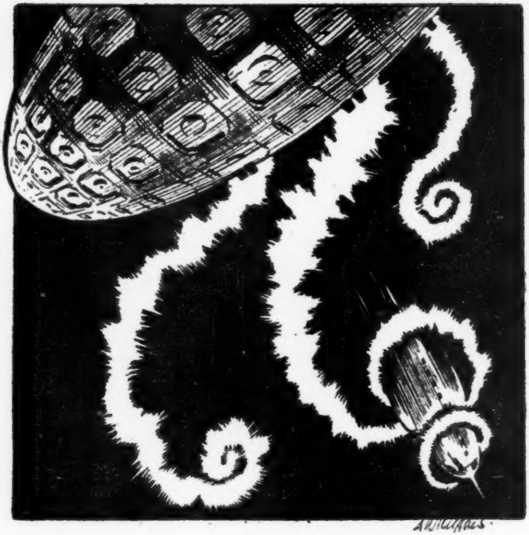
A battered space-tramp was ordered blasted out of space as a "dangerous object" by a sub-commissioner when in defiance of orders not to land in the Beta Cetacia solar system it dived toward the surface of an uninhabited planet. It had reported desperately that its crew was nearly out of food and the air-supply would last for only four more days. But it could show no proper clearance from its last port-of-landing, and was suspected of smuggling. The Navy ship which trailed it did not destroy it until it had landed and its crew had escaped, and was ordered to return to port for arrest and disciplinary action.

Three thousand colonists were refused landing-permits on Thetis IX, because of missing papers they swore they had turned over on the day of their arrival. (The papers were found months later in an under-clerk's desk drawer. He had forgotten to forward them. For the credit of the Service they were destroyed and the affair hushed up.)

The sub-commissioner on Arcturis V issued an order forbidding criticism of the Administrative Service until criticized conditions had been reported to and passed upon by the Administrative Service Board of Appeals. On the same day he denied four requests for appeals to the Administrative Service Board of Appeals.

On Sirius II, one Arthur Matheson was ordered arrested for making scientific experiments endangering the authority of the Galactic Commission. The experiments were those which led ultimately to the Matheson Matter-transmitter.

And it was reported to Reserve Headquarters that Ben Sholto's position had been approximately determined and his capture was a matter of hours.



But Ben was frantically fighting the intangible Thing which occupied Sally's body. Three times he charged Sally, in the insulated spacesuit, with the highest potential the static generator could produce. Three times he drove the Thing to frenzy. And three times he released the charge. The number of Things which roved triumphantly about the metalwork of the small ship increased visibly. There were at least a dozen. But Sally's body continued to glow. The Geiger counter continued to make a roaring noise rather than a clattering. The Thing—somehow Ben assumed that it was the original one—remained, tearing at the life which remained in Sally, consuming it and raking revenge for the hurt it had suffered.

The GC phone muttered and muttered. Once or twice it spoke loudly and distinctly. Some one of the searching ships was very near. Then there came the blasting tone-signal of a General Order, and Ben automatically touched the volume-control, half-crazed as he was by the urgency of the problem the Thing presented.

He had fired a single positron-blast at the Thing. The radiation from that blast had been picked up. The co-ordinates on it were not accurate but now someone used that very inaccuracy in a statistical method of making it impossible for Ben to escape from a closing-in mass of ships. It had to be assumed that Ben would listen in on Navy orders, and he had dodged past one Space-Navy cruiser by passing too close to it, too fast for its ranging devices to operate. This order forestalled any chance of his doing such a thing again. The order commanded every Navy ship within certain fixed classifications—at least two thousand ships in all—to assume the co-ordinates of the positron-beam blast to be no better than approximate, and to use random mathematics to alter them within certain fixed limits. Each ship was then to head for its arbitrarily chosen—but nearby—destination at maximum acceleration.

The Space-Navy would close in on the section of space in which Ben's little ship was, of course. But it would not come in in any pattern. The courses of the ships would be unpredictable. They would come together, but in a manner and at intervals and speeds none could compute. If Ben had been planning flight, he would have recognized its hopelessness. He might have dodged or crashed through any orderly arrangement of englobing ships, but this plan made evasion mathematically impossible. And, moreover, the General Order commanded the moving up of other thousands of ships behind the globe. Ben's positron-beam blast had been within or near the orbit of a meteor-stream. With all the might of the Galactic Commission behind the search for him, that meteor-stream would be examined. Every stony mass would be inspected. The task, of course, would be quite the most gigantic task ever undertaken even by the Galactic Fleet, but it ended, absolutely, any trace of hope for Ben and Sally.

But Ben had other, grimmer, more immediate reason for despair. Sally burned with fever. She had been rested, and she had been relatively strong. But now the Thing devoured her life.

Bitterly, he saw the flaw in the process which had driven the Thing out the first time. He had made Sally's body painful for it to inhabit. The first time, the Thing had fled at its first opportunity. But it had fled. It had not been forced out—it had been frightened out. And the Thing was intelligent. Now it realized that Ben would have to release the positive potential which caused it suffering, and that then it would cease to suffer. It endured the discomfort he created in order to work its revenge.

"I need," said Ben desperately, while the Galactic Navy moved to destroy him and Sally babbled in delirium, "to make something that will drag the Thing around! Drag it! Physically! And it isn't matter! It's just a pack of negative charges bound together. It's a bound charge. A bound charge—"

Electrons. A complex of electrons. It was energy on the verge of becoming matter, or matter past the verge of becoming energy. What can you do to an electric charge? How can you make it move, save by its own tension? What can you do to a bound charge?

"Bound charge . . . bound charge —" muttered Ben, with sweat beading his forehead. "Sally's dying, and I'm thinking about bound charges—the stuff kids learn in kindergarten! What's a bound—Ah-h-h-h-h!"

He plunged at his instrument board. He dragged ruthlessly at the GC phone. He pulled off the front panel by main strength and jerked fiercely at certain wires within it. He wanted plate-current and condensers and a tiny rectifier capsule. The condensers and rectifier went into a unit hastily built up on an insulated handle. The device terminated in a ball-contact. There was a single, long, flexible lead to the plate-current terminal of the last of the amplifying tubes of the GC phone. He worked madly, and when it was done he set the originating circuit in the phone to oscillating, and pushed the oscillation frequency up to a hundred million per second. But his take-off was from the plate of the last tube, which did not yield oscillating current, but merely pulsating. It was current which varied in voltage—but not in direction of flow—a hundred million times a second. And the variations in voltage were a thousand volts or more. He checked his device, sweating, and went over to Sally. He was shaking with hope and hatred and terror. He turned off the ceiling light. Sally glowed terribly. The multiplied metabolism of the Thing made her seem almost white-hot. Ben touched the ball-contact to Sally's cheek. He pressed the contact which let the pulsating plate-current flow into his condenser. The glow of Sally's flesh vanished.

It was just as simple as that.

Ben raged at himself for not having done it earlier. It is taught almost in kindergartens that when one plate of a condenser is charged with positive electricity, and the second plate connected to an insulated body, that free—negative—electrons in the insulated body will be drawn into the condenser. If the condenser is taken away, it will carry those electrons with it. If its capacity and applied voltage are high enough, it will leave no free electrons in the insulated body. And the Thing was a complex of free electrons.

But it had will. It was alive. It had intelligence, and it could hate. And such an entity could resist, could figuratively dig in, could symbolically sink its teeth and claws into the body it inhabited and resist the drawing power of applied voltage, even the maximum that Ben could apply. But one can resist a steady pull where an intermittent one is irresistible. The pulsations of the plate-current, as Ben had now arranged it, caused no steady pull, but instead a series of fierce and wrenching jerks at the resistance of the Thing. The current now shook the Thing. It tore at it like a dog at the throat of a rat. The Thing was brutally torn at, and brutally released, one hundred million times in every second. Nothing, material or immaterial, could withstand such a mauling. The Thing's grip was broken, its will shattered, its resistance made impossible—perhaps it was rendered unconscious! It flowed into the condenser, and the rectifier capsule prevented its return. It was imprisoned in the small device in Ben's hand—and an unholy triumph filled him.

He turned on the lights and put the condenser-device very carefully down. He made sure to put it on an insolantite surface—an insulator of practically infinite resistance. He put on insulating boots. He stood before the Geiger counter, and it gave no sign. He picked up Sally and carried her for the second time to the bunk he had insulated from the floor. He laid her there. She still babbled, and her eyes were fever-bright, but the cause of that fever was gone. She would return to normal—but probably terribly weak—within a very little time.

Ben returned to the control room. His eyes burned more brightly with hatred than Sally's had burned with fever. He regarded his device with a vengeful satisfaction. He cut off the switch and discharged the positive plate. The knob he had touched to Sally's cheek began to glow fiercely, even though the lights were shining. There was more than one Thing in the condenser. Freed from the electric bondage Ben had contrived, but with no path by which to escape to the metal skin of the ship, there was a fierce glowing of the compressed, intolerably crowded Things.

He turned the Geiger counter upon the knob. It clattered furiously. He turned it away.

"Ah-h-h-h!" he said thickly. "You're there, eh? And you know you're caught!"

He seemed to feel waves of pure hate enveloping him. He grinned savagely.

"You'd kill Sally, eh? You're smart! Maybe you can understand me, and maybe you can't, but you know what's going to happen, don't you?"

He took out the little positron-beam pistol. He put it within inches of the knob of metal which glowed with pulsating, hating light. He pulled the trigger. There was a reddish glow from the pistol. There was a searing, intolerable light from the knob. There was an unhearable, unbearable shriek—the feeling of anguish and rage and insupportable hatred.

Then the knob was merely a bit of metal attached to a condenser and an electric cord. It did not affect the Geiger counter. Ben licked his lips, his rage unappeased. He turned out the lights once more. There was a glow on the pilot's chair. He stalked it, and touched the knob to it with the plate-current on. The glow vanished. He turned off the switch and discharged the positive plate. The knob glowed. More faintly, to be sure. There was but one Thing trapped this time. Ben laughed without mirth. He gave the Thing a blast of the positron beam. It screamed soundlessly and died.

Sally's babbling ceased. She called faintly. Ben went to her, all savagery and hate. He gave her water.

"I'm killing them!" he said thickly. "I'll get all of them! I'll kill every one! They made you suffer. They'd have killed you! I'll get every one—"

Sally smiled tiredly at him. She was utterly exhausted, and she was very weak indeed.

"We'll have to send word somehow, so they'll know what to do if the plague ever shows up anywhere else—"

Ben remembered. Sally was thinking in terms of hope, but there was no hope. He was killing the Things because they had harmed Sally. But the orders he'd overheard a little while back made anything he could do a mere futility. And worse, the plague had already spread from Pharona. A newscast, hours since—he'd hardly noticed it at the time—reported that a Galactic Commission cruiser had landed on Pharona with dispatches for the local sub-commissioner. He could not be cut off from his regular flow of documents to sign! It observed all sanitary precautions. But it did not think to prevent any possibility of bound electric charges entering its metal fabric. So when it went on to Galata it carried the plague, and women were now dying by thousands, and other women by more thousands glowed faintly with cosmic rays coming from their bodies.

Ben told her, his face savagely stern.

"We must tell," she insisted. "Even if we die, Ben—"

"My dear," said Ben bitterly, "you know the brass hat mind. The instant we open communication, every ship that's hunting us will come bouncing here to blast us out of space. And they'll find us. *If* we can get our information to them and on their recorders before we're killed . . . why . . . sooner or later, after maybe millions more lives have been lost, the information we've given will be passed on as the result of brilliant investigation under the supervision of brass hat so-and-so. But we'll be dead and disreputable. And we'll stay disreputable after we're dead, so that some pompous ass can claim credit for what we've found out and get a few more decorations to hang on his fat tummy."

"Maybe hers," said Sally. She lay there in the bunk, looking up at Ben with soft eyes. "Some brass hats are women, and a woman brass hat is even worse than a man. You can't blame them, Ben. They're important people. They have important posts. So they get dignified and pompous and stupid. If they could only feel that its their work instead of them that's important—"

"But they never will," said Ben grimly. "So we die. I pulled down the GC phone to get rid of the Things. I'll kill off the rest and put the phone back together. Then I'll broadcast my stuff, and we'll sit down and hold hands until we're killed."

"Darling!" said Sally wistfully. "Would you mind kissing me? You haven't kissed me but twice since we've been together—"

He bent down. He kissed her. And then they clung, suddenly. The little sports cruiser had reeled. Something had hold of it. With a tractor-beam. Ben fought against a savage acceleration, applied from without, and then there was a violent impact. They had been drawn violently against the hull of a much larger vessel. Tools worked instantly on the air lock, and before Ben could do more than reach the door of the stateroom with his positron-pistol in his hand, he found himself looking into the muzzles of other positron-guns. Navy men faced him.

"You're under arrest, Sholto," said a voice crisply. "We were ordered to burn you down on sight, but since the plague's hit Galata, we've got instructions to do it before a visiphone screen as a warning to anybody else who has the idea of breaking a planetary quarantine. Come along!"

VII.

Brass hat: an idiom accepted as Auxiliary Basic since Circa 2126 Earth Style. It originally referred to the headgear used to distinguish "staff officers" in an army (See ARMY) who gave orders without responsibility for their result, and which they were required to justify only by precedent, "political necessity" or "strategic reasons,"—terms which have no discoverable exact meaning. Costly blunders by officers of the mental pattern AF-IQ-R.37 and its derivatives—(to whom the career of a "staff officer" was irresistibly attractive in time of war)—led to the use of the term "brass hat" to indicate persons of those now-recognized mental patterns. It is an interesting case of instinctive popular recognition of mental patterning before personality analysis emerged from charlatanry.

(*Dictionary of Auxiliary Basic Words and Idioms.* Cephus, Antres VII. 2215 Earth Style.)

Ben grinned. There was no particular mirth in it, but it was the only possible expression of the way he felt.

"Ah-h-h!" he said softly. "The brass-hat mind in action! The order undoubtedly ended, 'this order is not to be questioned'. But try and carry it out! You can kill me, of course. But I've a pistol in my hand, too. Try and drag me to a visiphone! And you've got a boarding-mike with you, haven't you? Ah, yes! Everything I say will be recorded and goes through all the ranks of brass hats up to the Galactic Commission, if necessary. Very well! This is a plague ship. I have a girl here who has had the plague and has been cured of it. I know how to cure the plague. But the ship is infected—and so is yours, now! If there are as many as a dozen women on board it, you've got a dozen cases of plague in your ship's company, and you've only to set a Geiger counter in front of any one of them—or stand them in the dark—to find it out! What I've said is recorded! Now kill me and go and land on any planet in the universe!"

The boarding officer said uncertainly:

"I have orders to take you to a visiphone screen and blast you before it."

"Try it!" said Ben savagely. He shook with fury. Because it seemed that every hope was gone, not only of his own life and Sally's, but of being able to get past the wall of pompous stupidity brass-hattism had erected. The Space-Navy and all interstellar traffic suffered intolerably from a policy which assumed that infinite wisdom lay in any person with authority to issue an order, and that only blind obedience should be practiced by inferiors.

He raged at himself, too. It was his use of the positron pistol to kill the Things which had led this Navy cruiser directly to him. Pulling out the GC phone to get its condenser had left him unaware of demands for surrender. His screens had been off. And now he would be killed, and the plague would go all through the galaxy. Because, of course, brass hats would refuse to believe anything they did not already know, and they would solemnly remove themselves from infected planets—with all sanitary precautions, of course—to exercise their authority elsewhere, and they would spread the plague themselves.

The boarding-officer's helmet phone hummed. His uncertainty vanished.

"Very good, sir," he said to the air. To Ben he said, "Your first statements have been checked. Four cases of plague have been found already. You say you can cure them. They will be brought here. The order for your execution is suspended for the time being."

"I'll do it," said Ben curtly, "in the control room."

People crowded through the air lock and into the control room. There were four women and a stout and pompous individual with the brass tabs of an under-commissioner. Of brass hat rating—and brass hat mentality.

"You are incredibly insolent!" he puffed. "You have defied the authority of the Galactic Commission! It is unheard of!"

"Also," said Ben grimly, "I've found out how to cure the plague. If you can't think of anything but my defiance of authority, you're a fool!"

The brass hat purpled and gasped. But Ben turned out the lights. The four women, in Space-Navy Auxiliary uniform, stood out starkly in the darkness. Their faces and throats and hands glowed with a pale white light. Ben picked up his condenser. He touched it to the cheek of the first woman, whose features were working convulsively. The glow vanished from her. The little knob glowed instead. Ben held it out and gave it a momentary positron blast. There was the feeling of a soundless scream. He touched the second woman. She no longer glowed. A second blast. A second unheard shriek. The third. When he had drawn the Thing from the fourth woman he did not use the blast upon it. Instead, he turned on the lights.

"Those four cases of plague are cured," he said shortly.

The brass hat puffed.

"In that case," he said querulously, "there is nothing more to be done. Regulations have to be obeyed. You will carry out your orders, lieutenant."

The boarding-officer's jaw dropped.

"You mean, sir—"

"He's been ordered to be executed," said the brass hat, indignantly. "Hasn't the Navy learned yet that orders are to be obeyed first and questions asked afterwards?"

Ben released the last Thing into the fabric of the ship.

"But the plague isn't finished," he said, his eyes burning. "I inform you—and all my words are recorded—that if you land on any planet without my having cleaned your ship of the plague, you will start the plague again wherever you land."

"But—that's blackmail!" cried the brass hat.

There were sounds. Three more people came through the air lock. Two were the ranking officers of a Space-Navy cruiser. The third was a white-haired woman in a gray cloak. She had alert, intelligent eyes.

"Ma'm," bellowed the brass hat. "This man has insulted and tried to blackmail the Galactic Commission! I have ordered him blasted!"

It would be unthinkable, of course, to carry out a death sentence in the presence of a member of the Galactic Commission itself. The white-haired woman said gently:

"More immediately important, I am afraid, is the fact that he called you a fool." She looked at Ben. "I am Myra Thorn. I am one of the Galactic Commission. I was on my way to Galata, where the plague has broken out, to try to press its investigation. Within the past five minutes it appears that I have developed the plague myself. I feel that there is something within me, but separate from me, which gloats in triumphant hate. A Geiger counter verifies my diagnosis. And . . . I glow in darkness. The plague is a form of life, is it not? An entity which is not quite matter?"

"Yes, ma'm," said Ben. He regarded her from beneath frowning brows. "It is an organized form of electron gas."

"I wish," said the white-haired woman, "that you would broadcast—through the cruiser's GC phone, since your own is dismantled—all the information you have on these entities, and the method you have devised for destroying them."

"Yes, ma'm," said Ben. He still regarded her steadily.

"Then, at your convenience," she said quietly, "you may clean the cruiser alongside, and last of all—but I must be last—you may cure me of the plague."

"Easy enough," said Ben grimly.

"Very well—"

The brass hat bleated:

"But ma'm, there is an official order that he shall be blasted immediately upon his capture if not on sight! It is irregular! It is unheard of! A Commission order—And he has defied the Commission! He tried to blackmail it!"

The white-haired woman said meditatively:

"To be sure. Formalities must be observed. So I formally annul his sentence. And, by the way, I order you under arrest for court-martial. The charge will be stupidity, incompetence, and arrogance. I have to make a charge," she added mildly, "so we can have a psychometrist make a complete chart of your personality. Really, we must make regulations to keep your sort from having authority, hereafter. You do too much damage." She turned again to Ben. "Now, what will you need?"

"Five minutes with your technical officer," said Ben briefly. "Then he can do anything I could. But ma'm, I have a girl on board. She's been officially reported dead, and sentenced to death afterward. I would like—"

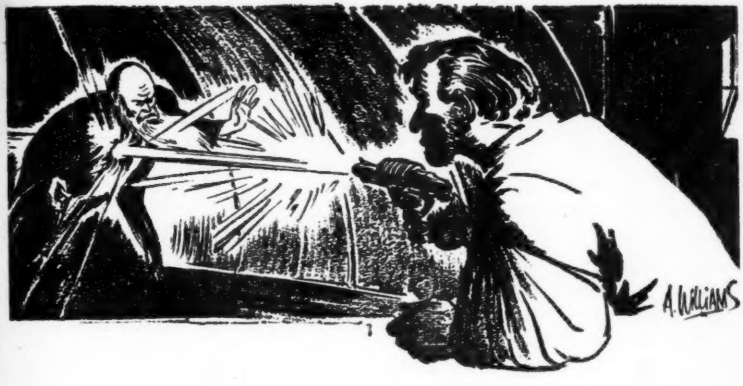
"A pardon? Of course!"

"No, ma'm, a wedding," said Ben. He grinned.

(Formal announcement by the Galactic Commission, Sitting in Executive Session, January 16, 2195.)

"The Galactic Commission makes it known that it recognizes that the plague upon Pharona, and its very great threat to the entire human race, cannot be blamed upon anything but certain ill-advised actions of members of the Administrative Service. Members of the Commission, having discovered this fact, have discovered other and further evidences of extraordinary incapacity and stupidity among high officials of the Administrative Service, and have determined that such persons fall into certain mental patterns which from now on are to be forbidden. Persons falling within patterns . . ." (Here follow a list of sixteen mental patterns) "are forbidden hereafter to hold any office under the Commission, or any office of authority in any enterprise under the Commission's guidance. The Commission recommends to planetary governments that such patterns be forbidden planetary positions of authority also, but since politics has enormous attraction for persons of these types, it cannot expect that they can successfully be excluded from legislative bodies until genetics supplies a means of breeding these strains out of the human race."

THE END.



Taboo

by Fritz Leiber, Jr.

***The** sanctuaries were protected against the self-willed warriors—by the self-interest of warriors. Most taboos have a good, even a potent, reason—*

Illustrated by Williams

"In the name of the Great Heritage, I claim refuge!"

The voice was strong and trumpet-clear, yet with a curious note of mockery. The face was in shadow, but the embers of a smoky sunset outline, with smudged brushstrokes of blood, the giant figure. The left hand lightly gripped the lintel of the low doorway for support. The right hung limp—Seafor noted that there the sunset red merged into real blood, which now began to drip upon the floor.

Seafor looked up. "If I am not mistaken," he said, "you are Arnine, the outlaw—"

"When there was law, or rather, the illusion of law, which there hasn't been, in my lifetime," interjected the other, in an amused rumble.

"—who has ravaged a hundred petty domains," Seafor continued imperturbably, "who has thieved, kidnaped, and killed without mercy, whose trickery and cunning have already become a legend, and who does not care one atom in chaos for the Great Heritage which he now invokes to save his life."

"What difference does that make?" Arnine chuckled. "You have to grant me refuge if I claim it. That's your law." He swayed, gripped the lintel more strongly, and looked behind him. "And if you don't cut your speech of welcome pretty short, it'll be my funeral oration. I'm still fair prey, you know, until I'm inside the door."

There was a sudden humming in the murky sky. A narrow beam laced down, firing the air to incandescence, making a great gout of blinding light where it struck the ground a dozen yards away. Immediately came thunder, a puff of heat, and the smell of burning. Seafor fell back a step, blinking. But in the empty hush that followed the thunder, his reply to Arnine sounded as cool and methodical as his previous remarks.

"You are right, on all counts. Please come in." He moved a little to one side and inclined his head slightly. "Welcome, Arnine, to Bleaksmound Retreat. We grant you refuge."

The outlaw lurched forward, yet with something of the effect of a swagger. As he passed Seafor, there came from beyond the door a groan of the sort that sets the teeth on edge. Seafor looked at him sharply.

"You have a companion?"

The outlaw shook his head. He turned, so that the ruddy sunset glow highlighted his lean, big-featured face—a dangerous, red-haired god, a hero with a fox somewhere among his ancestors.

"Some beast, perhaps, singed by the blast," he hazarded, and showed his teeth in a long, thin smile.

Seafor made no comment. "Hyousiks! Teneks!" he called. "We have a guest. Attend to his hurts. Relieve him of his weapons." Then he took down from the wall a small transparent globe with a dark cylindrical base and went inside.

It was a ragged and desolate landscape that opened up for Seafor. The crimson band of sky edging the horizon heightened the illusion that a forest fire had recently burned through it. Dead and sickly trees were outlined blackly.

Seafor skirted the blasted patch, holding up the globe, in which a curled wire now glowed brightly. The humming returned. He did not look up, but he moved the luminous globe back and forth to call attention to it.

The groan was repeated. A metallic shimmer caught Seafor's eyes. A few steps brought him to the wreck of a small flier. Beside it, in an unnaturally contorted posture, was sprawled a small figure clad in rich synthetics.

Seafor unlashed the small wrists, and did a little to ease the broken ankle. The boy shuddered and tried to draw away. Then his eyes opened.

"Seafor! Seafor of Bleaksmound!" There was surprise in the shrill voice. He stared and plucked at Seafor's sleeve with his skinny fingers.

The humming increased. It was as if the buzzing of one giant wasp had brought others.

"You're safe now," said Seafor. "Arnine's gone. Your father's men will be here very soon."

The boy's fingers tightened. "Don't let them take me," he whispered suddenly.

"Don't you understand? I said your father's men."

The boy nodded. "Please don't let them take me," he repeated in the same imploring whisper. "I want to stay with you, Seafor. I want to stay at Bleaksmound."

Within seconds of each other, four fliers grounded, their repulsors scattering clods of black soil. From each, two men sprang.

The boy tugged frantically at Seafor's arms, as if by that means he could force a nod or a reassuring smile. Then a kind of boyish cunning brightened his eyes.

"Refuge, Seafor," he whispered. "I claim refuge."

Seafor did not reply and his expression remained impassive, but he hooked to his belt the globe which he had previously set down, and carefully lifted the boy in his arms.

The men hurried up. They wore identical emblems on their blue synthetic coveralls and skull-tight hoods. They carried blasters. They seemed like soldiers, except for a lack of discipline and a kind of animal bleakness that darkened their faces like a tangible film. Because of that film, they did not even seem human—quite.

Seafor's gray robe was crude and beggarly compared with their sleek clothing, but his pale, stern, ascetic face, like something carved from ivory, shone with a light that further darkened theirs.

Now that they faced him, a certain confusion became apparent in their manner.

"We're Ayarten of Rossel's men," one of them explained. "That's his son you've got there. Arnine the outlaw kidnaped him, intending ransom. We brought down his flier."

"I know that," said Seafor.

"We're grateful to you, outsider, for the help you've given Ayarten's son," the other continued. He stepped forward to take the boy, but his manner lacked assurance.

Seafor did not reply. The boy clung to him. He turned and walked toward the dark, square mass of Bleaksmound.

"We must take the boy home to his father," the other protested, following a step. "Give him to us, outsider."

"He has claimed refuge," Seafor told them without turning his head, and walked on.

They conferred together in whispers, but no action came of it. They watched the luminous globe jog gently up the hill, casting a huge fantastic shadow.

"Gives you the shivers," muttered one. "Dead men. That's what they're like. Dead men."

"You can't figure them out. Think of getting light by heating a wire inside a ball of dead air. Like our primitive ancestors. And when there's atom power a-plenty!"

"But they give up atom power, you know, when they give up everything else—when they die to the world."

"Imagine the boy asking for refuge. Scared out of his wits, I suppose. Never catch me doing that."

"I always thought young Ayten was a queer boy."

"Ayarten won't like this when we tell him. He won't like it at all—not with Arnine taking shelter in the same place. He'll be angry."

"Not our fault, though."

"We'd better hurry. Set the cordon. Report to Ayarten."

Burly, blue-tinged shadows, they dispersed to their fliers."

Seafor handed the boy to two of his gray-robed brethren, who had a stretcher ready, and preceded them to the infirmary. He met Arnine coming out of the weapon room under escort, and noted the greedy look on the outlaw's face.

"Remarkable collection you have there," said Arnine. "Some of the fine old models they don't turn out any more. And so many!"

"Some people die in refuge," Seafor explained. "A few become outsiders. And some go away without reclaiming their weapons."

Arnine's ruddy-gold eyebrows arched skeptically. He seemed on the point of launching a satirical reply when he noticed the stretcher.

Seafor motioned the bearers on to the infirmary. "Do you feel up to having dinner in the refectory?" he asked.

The outlaw laughed boisterously, as if the idea of his being too sick to eat was very humorous indeed. His arm was in a sling and the feline springiness had returned to his stride. Seafor accompanied him back along the gloomy corridor.

"Is it your intention to become the accomplice of a kidnaper?" Arnine asked in amused tones a moment later. He showed no embarrassment at his previous lie having been uncovered.

"The boy claimed refuge," Seafor said.

"They'd have found him soon enough, and that would have satisfied Ayarten. But the way it is now— Well, you're lucky that the border war with Levensee of Wols is keeping Ayarten's hands full. Still, even that may not be enough." He shrugged his good shoulder.

An elderly man turned into the corridor some distance ahead of them. He wore a green uniform of archaic cut, faded and frayed but very neat. Disks of a greenish metal formed the chief insignia.

"The president of the Fourth Global Republic," Seafor replied in answer to Arnine's immediate question. "Been in refuge here for the past year."

The outlaw expressed incredulity. "Why, if that were the case, he'd have to be two hundred . . . two hundred fifty years old."

"Not at all. When the last elected president died, he exercised his power to appoint an emergency successor to serve until elections could be resumed. Several of his cabinet members held the office. When the last of those died, he handed on the executive authority to some faithful subordinate—perhaps a secretary or bodyguard. It's gone on that ever since."

Arnine roared with laughter. "Do you mean to say that that old chap still thinks of the state of the world as merely an emergency temporarily interrupting the majestic and tranquil course of the Fourth Global Republic? Is *he* grooming a secretary to succeed *him?*"

Seafor shook his head. "He was alone when he came here. He is a very old man. He has decided to sign over his authority to me, when he dies."

Arnine's laughter became Gargantuan. "One more worthless tradition for you to guard! One more trinket tossed into the rubbage bag of the Great Heritage!" He looked at the man ahead more closely. "I see a blaster. Isn't that against your rules?"

"As commander in chief of the Earth's armed forces, we have granted him certain extraordinary privileges," Seafor replied imperturbably.

Arnine shrugged his shoulder, indicating that it was impossible to find a laugh big enough to do justice to that jest. They had caught up with the old man now, and Seafor introduced them.

"Your excellency—Arnine the outlaw."

The old man inclined his head politely. "It is always good to meet a fellow citizen. Though I warn you, sir, that when peace is restored I will have to proceed against you with the utmost severity." There was a grave twinkle in his eyes. "Still, no need to dwell upon such subjects now. Perhaps you can give me news of what's happening outside this little corner of the Republic. Surely an outlaw ought to get around." His voice became thoughtful. "No one seems to travel any more—perhaps because it's so easy."

Arnine seemed to derive amusement from replying in the same quaintly polite veins. Seafor left them talking amiably and returned to the infirmary.

A gray-robed doctor was setting the broken ankle. Unmindful of his sharp command the boy tried to sit up.

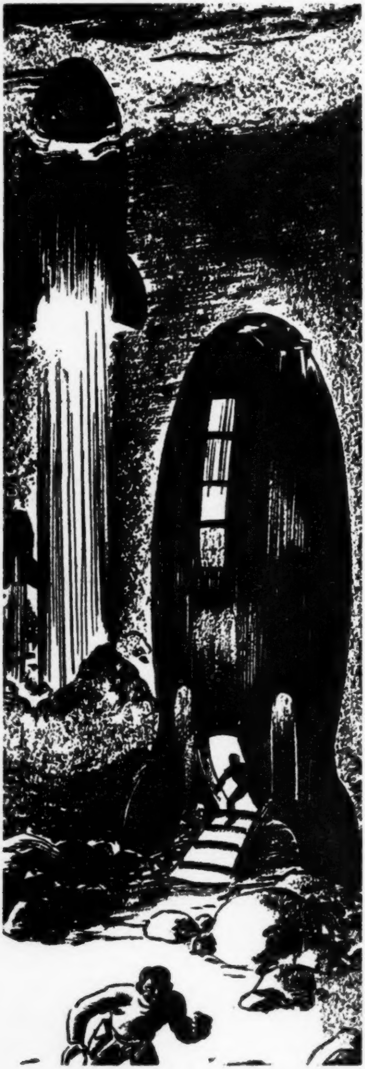
"Can I stay here, Seafor?" he called anxiously.

Seafor nodded. "For the present, at least. Now be quiet."

He stood beside the bed until the doctor had finished. Then he looked down at the small damp face and asked, "Why do you want to stay her, Ayten? Why don't you want to go home?" A faint smile touched his thin, pale lips.

The doctor went out.

The boy frowned, trying to find the right answer. A look of fear came into his eyes. "I don't want to go home because . . . because they're not human beings—not



father or his women, or any of them. They're—animals."

"All human beings are animals," said Seafor softly.

"When I was little, I thought they were gods," said the boy. "I took it for granted we were all gods. Why shouldn't I? Things that take you up in the sky at the touch of a finger, transformers that synthesize food and clothes and dwelling domes, weapons that annihilate, picture tapes that tell you how to do things—all that and more!

"But gradually I realized that something must be wrong. All those wonderful things didn't square with our cramped lives, with the endless jealousies and quarrels and killings. Nobody ever had a new idea. Nobody ever seemed to think. Nobody could answer my *real* questions—neither could the picture tapes. They couldn't tell me why the world seemed to end at the boundaries of Rossel, why we almost never saw strangers, except to kill them, why, with all those wonderful powers, we lived like beasts in a cave!"

His face was flushing with the excitement and relief of talking out his thoughts. Quietly Seafor laid his hand on the small shoulder.

"For a long time I told myself that it must be a kind of test," the boy continued, "that they were seeing if I was worthy of the domain of Rossel, and that some day, when I had proved myself, a door would open and I would walk into the real world, the big friendly world I knew must exist somewhere.

"Now I know there is no door. The real world doesn't exist—except for you outsiders, in some way that I don't understand. And you've given up all the things that we possess." He caught hold of Seafor's wrist. "Why is that? And why, with all our powers, do we live like animals?"

Seafor waited a moment before he spoke. "There was a real world," he said. "There's still a little of it left, and some day it will all come back. Civilization came because men needed each other. They found that life was easier and better if they traded together—not only the necessities of life but also the things that can't be weighed or measured and that haven't a definite barter value, like the beauty of a song, or the joy of dancing, or the understanding of each other's troubles and hopes.

"As civilization grew, that mutual dependency increased and became infinitely complicated. Each man's life and happiness was the work of millions of his fellow workers.

"But there were forces working in the opposite direction. Man was learning to synthesize materials and make use of universal power sources. Wars accelerated this process, by periodically shutting off supplies of essential raw materials.

"That trend reached its ultimate development with the perfecting of atomic power and the invention of multipurpose transmutators capable of supplying all the necessities of life anywhere.

"At almost any other time that development would have been a great boon, freeing man's energies for more intensive participation in the social quest. But the shadow of the Second Global Empire still darkened the Fourth Global Republic, and interplanetary war with the Venusian and Martian colonies sapped its strength. The Great Migrations began. There was an endless, seemingly purposeless surging of populations between the three planets, attended by wanton massacres.

"The end product was stagnation. Distrust in the very forces that brought civilization into being. Humanity turned in upon itself, mentally and physically. Small communities came into existence, each built around some leader who had a little more energy and determination left than any of his fellows. The stragglers were killed, or they drifted into such communities—and stayed there. Men were tired. They wanted only to attach themselves to a single locality—to the soil. A vegetative cycle succeeded a cycle of movement.

"In any previous age, hunger and want would have broken that unwholesome equilibrium. But now each little community was independent of trade, so far as the necessities of life were concerned. And as for the things that have no definite barter value—disillusioned men could get along without them.

"The jealousies and rivalries and suspicions of small-community existence came to make up the whole of life. Strangers were persecuted. There was almost continual warfare between neighboring communities, but it remained a petty, spiteful warfare, incapable of giving rise to widespread conquest and the establishment of nations, because it lacked any enduring economic motivation.

"That's the sort of world you've been born into, Ayten."

The boy said nothing. Seafor continued, "A few men realized what was being lost. They saw all of Earth's cultural heritage sliding into oblivion, save the bare minimum needed for the new self-maintaining mode of life. Reading and writing, for example, were going into the discard—picture tapes were sufficient to transmit the necessary education.

"These men found that they could not change the small-community system of life from within. So long as they remained part of it, they would have to conform to its savage and inhospitable laws. So they got out of it. They gave up atomic power. They gave up all valued possessions. Only by paying that price could they purchase even the most shadowy immunity from attack. They formed small communities. They devoted themselves to preserving the cultural heritage and to maintaining the ideals of universal brotherhood and of individual honor and integrity. They became the outsiders."

Ayten whispered, "I want to be an outsider."

Seafor nodded with a frown. "I tell you what," he said finally. "You can live with us as a novice, and work and study for a year. Then, if you're still determined, we'll talk it over again."

Ayten smiled.

In the refectory, Armine's brown-and-gold tunic made a gaudy break in the long rows of gray, as did the clothing of the other refugees.

Seafor paused by Arnine. "How does it taste after a diet of synthetics?"

The outlaw turned around. "Inferior, of course. But I've been in refuge before. Where do you get such garbage?" he inquired pleasantly.

"Most of it we grow in shallow tanks on the roof."

"Swamp plants, I suppose?"

"No. They originally grew in dirt."

Arnine's long lips curled in mild and somewhat humorous disgust. There came the faint chiming of the bell over Bleaksmound's door. "How's the boy?" he asked suddenly. "Only slightly hurt? As I thought. You'll be sending him back to his father, of course?"

"On the contrary. He has decided to become a novice."

Arnine stared at him through half-shut eyes. "You play a strange game," he said finally. "Turning a kidnaping into a conversion! It turns out that *I* am *your* accomplice! Do you realize the trouble you're brewing? Outsiders exist only on sufferance, you know."

"You mean I should honor your claim of refuge, but not his?" Seafor's eyes were enigmatic.

An outsider approached Seafor from the hall. "Ayarten of Rossel is at the door. He desires to speak to you."

"You see?" said Arnine sardonically. "The way things are going, neither claims of refuge is likely to amount to much. Let me know the terms of his ultimatum."

Seafor went out. Swiftly the refectory emptied as the outsiders went off to their tasks. Two remained, ostensibly to converse with Arnine. The outlaw, prowling restlessly between the empty benches, did not make their task any easier. His ears were cocked all right, but for noises outside the refectory rather than in it. His movements were aimless, seemingly, but when Seafor returned he was standing by the door.

"He gives us until dawn," said Seafor, "to give up the boy."

"And if you refuse?"

"He threatens to make an example of Bleaksmound."

"You see?" said Arnine. "He didn't let his border war with Levensee hold him back."

"I was not counting on that," said Seafor. "Though it strikes me that he is unwise in drawing off so many of his men for the cordon he is setting around Bleaksmound."

"And you will refuse to give up the boy?" Arnine's voice was edged with anger.

"I gave the boy my word that he could stay in refuge," said Seafor. "In the days of the great civilizations, mankind could afford some weaknesses in the individual moral fiber, because the general progressive trends were strong enough to nullify individual treacheries. But now trust in a man's word has become part of the almost forgotten heritage. If we cannot keep that alive, then all the outsiders' work is vain."

Arnine laughed, but unpleasantly.

"Very well," he said. "In that case I shall leave Bleaksmound, for obvious motives of self-preservation."

"Ayarten has set too strong a cordon," said Seafor. "You wouldn't be able to."

"That is for me to judge. Please give orders that my weapons be restored. I leave at once."

Seafor shook his head. "You are our guest. We cannot let you go so soon."

"You mean to hand me over to Ayarten?"

"No. You claimed refuge. You shall have it."

Seafor's sleep turned into a restless, rocking darkness, alive with menace. There was a hand at his shoulder. Someone was shaking him awake. He sat up.

"Ayarten has come?"

"No, but Arnine has escaped. Knocked us down. Darted down a side corridor. Can't be found."

He recognized the voice of Hyousiks, one of the two outsiders he had set to guard the outlaw. He threw on his gray robe and hurried out.

Bleaksmound was alive with movement, like a nest of gray ants in which a spider is loose. Seafor made for the infirmary. It was as he expected. Young Ayten was gone.

From ahead came the hiss of a blaster. Seafor hurried to the entry hall.

Arnine stood with his back to the outer door. In his good hand he held a blaster. The other was out of the sling and fresh blood stained the bandages. At his feet lay young Ayten, unconscious. Arnine's face was racked with pain but he smiled tautly.

Seafor strode toward him. When there was only a few feet between them, Arnine leveled the blaster.

'The first was only a warning," he said. "This time it will be for business."

Seafor stopped.

"I mean to bargain for my life with Ayarten," Arnine continued. "Later you will realize that it was for your good, too."

Behind Seafor the circle of silent gray-robed figures parted to make way for an old man in faded green.

"Who dares do violence in Bleaksmound Retreat?" The voice of the President of the Fourth Global Republic quavered, but a note of iron determination came through. "My authority holds here. Outlaw, put down your weapon." He fumbled with trembling hand for the blaster at his hip.

A ray of blinding light touched the old man, pierced him. Arnine laughed.

In that instant, Seafor lunged forward. The ray shifted, nicked the gray robe, sizzled against the stone floor. Then Arnine was down, grunting with pain because Seafor had thrown him so that he fell on his wounded arm. With both hands Seafor gripped the blaster, wrested it from him, sent it spinning across the floor.

Arnine stopped struggling. "You've wrecked your own last chance of safety," he said.

Seafor knelt on his chest. "And you have murdered. We have law here, although it holds good only within these walls. Our penalty for murder is lifelong imprisonment."

The bell began to clang deafeningly.

Through his weakness and pain Arnine smiled.

"I think that penalty has been commuted to sudden death—likely for all of us. You know who that is. Dawn has come."

The door opened. It was Ayarten of Rossel, burly, mean-visaged, clad in cloth of gold. But he staggered, his face was chalk-white, the cloth of gold was torn.

He did not see his son lying at his feet.

"Refuge!" he cried. "Levensee of Wols has struck. He has seized my domain. Those of my men that remained have gone over to him. I claim refuge!"

THE END.

Brass Tacks

The invention of the chronometer, the long rifle, the cartridge, the sextant, and a lot of important technical devices can be traced to the demands of an expanding land frontier. The asterites will demand inventions, too.

Dear Mr. Campbell:

Analytical Lab report for August:

1. "Judgment Night." A little of this kind of fantasy, slow-moving but rich in description, is a welcome change. Miss Moore resists, even in the episode on the pleasure-planet, the temptation to sink into extravagant romanticism. I eagerly anticipate the promised photofinish! A+.

2. "The Mutant's Brother." More from Leiber, please. A.

3. "Endowment Policy." The usual hair-raising Padgett ending. But a somewhat less detailed expounding of the geography of New York City might have been preferable. B+.

4. "One-way Trip." The picture of "Sollywood"—miserable pun—a direct transplanting from this century, but did not square with the description of the post-Devarupa society. Except for that—very important—fault, a dandy story. B.

5. "M 33 in Andromeda." Either van Vogt is deteriorating or his enthusiastic over-writing is beginning to pall; for this long-awaited sequel fell far short of the first two monster stories. B.

5. "When Is When?" Another disappointing sequel. It was too short; it lacked the interesting historical and quasi-historical detail of "Anachron" and "Barrius"; it broke, I think, with the theory of time-travel Jameson started with; and I can conceive of no time-machine which would conform to the edicts of Pope Gregory. Altogether, pretty punk. C.

Ley's article extremely interesting. Prof. Oberth is as fantastic a character as any in fiction.

I am told you don't have much say about the art work, so I'll restrict my comments thereon to praise of the much-panned Kramer and Kolliker, and doubt that the latter's helicopter in "One-way Trip" could be steered.

In answer to your statement in the editorial that s-f authors don't credit the world of the far future with a sufficiently high technical development, I would like to point out that the rate of scientific progress depends greatly on the society. (Don't say the rate has increased steadily in the past; it hasn't.) I suspect that to find in the future a period of progress as rapid as today's you would have to look ahead to the time when the planets have been settled and developed. Then, as now, you would have an economics based on expansion, without a land frontier. Result, the "scientific frontier." But during the exploration of the Solar System there might be a virtual hiatus in scientific activity. So, let the intrepid asterites keep their glass windows and pig-bristle toothbrushes.

Thanks for the long Brass Tacks, and thanks to Caleb Northrup for an extremely interesting letter.

Boucher's review quite exciting. I'll have to buy that book.

"Hell Hath Fury," in your companion magazine, gained at least one regular reader for *Unknown*. Cartmill's code of ethics is neither churchy, over-vindictive, nor technical; his characters are human even in the presence of supernatural influences.—Chandler Davis, Shawn Hill, Sandwich, Massachusetts.

Ley is doing a book on the whole status of rocketry now.

Dear Mr. Campbell:

Right from the start I felt that the August Astounding was going to be one of the banner issues of the year. Nor was I far from wrong. Here's how it rates:

"Judgment Night"—C. L. Moore: For her first stf epic Miss Moore has outdone herself. By far the most beautiful piece of writing this year has produced; better even than the marvelous "There Shall Be Darkness." My favorite science-fiction stories embody certain little fantasy suggestions as are in this story. Little things like the *llar* and its behavior, the visit to Cyrille—that was a real thrill!—and all the tiny fantasies that transpired there, and I especially enjoy going down into some deep underground passage that simultaneously holds so much of death and an equal amount of life. These are perfect touches, but they alone could not sell me on a story so completely. Moore has dug up a rather ancient plot, smoothed it into a new setting, and shined it up like new. The wonderful description is, to be VERY trite, out of this world.

Second best story is van Vogt's "M33 on Andromeda." It's the best van Vogt short I've yet read. I was beginning to think he only shone on the novels and novelettes, but here I find almost all the qualities he gives to his longer stories—good characterization, fine description, and a plot thick and juicy—and it is a pleasant discovery indeed. The plot is rather like something Heinlein might cook up in a way, although I can't quite put my finger on just what way.

Rating third place is Lewis Padgett's "Endowment Policy." Very good, and with a surprise ending, yet! Not up to Padgett's usual standard, but quite acceptable. Just what sort of a scene would have taken place had Smith succeeded in his plot?

Coming in fourth is Malcolm Jameson with his "When Is When?" Worthy, but not half so good as the other stories in this series. It doesn't capture the same spirit.

In fifth spot is Boucher's "One-way Trip." A wonderful plot with a great many novel ideas which held my interest. The locale was very good, too. Only one other author has used the same locale—Roby Wentz, and his time was a *much* earlier date. Well written, too, and up to the very last two pages I thought it would be among the best ten of the year, but alas, those two pages spoiled it immeasurably and irreparably. Should not have been accepted with that ending.

Taking a back seat this time is Fritz Leiber, Jr., with "Mutant's Brother." Another well-intentioned story that fell slightly flat at the end. It, too, is well written. Subject matter could use a little more treatment in your magazine. After reading this, I think Leiber had better stick to fantasy.

In a niche all its own is Ley's article. It is far and away the best article he has ever done, possibly because he is so much interested in this subject. He tells it with more vigor than I thought he had.

Oh, and I meant to make special mention of Kolliker's drawing on page 103. Your best interior so far this year! If Koll would only keep this up!!—Virgil Utter, Jr., 1323 12th Street, Modesto, California.

Ye Ed is doing no more prophesying for the duration; Astounding and Unknown may reappear in large size A. T. W., but don't quote me! At present, paper is so tight, and gets tighter so suddenly, that the October Unknown carries an editorial about the new, small-size Unknown—but, after that issue was printed, our paper was cut again. Sorry—there won't be any new Unknown for the duration! So I quit prophecy.

Dear Mr. Campbell:

Just a brief word of comment on the September issue of Astounding.

The outstanding story of the issue was, of course, the concluding installment to C. L. Moore's "Judgment Night." As you yourself intimated, the ending will "live" with your readers for several days—particularly with this reader. I know of only one other story that achieved such an effect with its ending; that being "But Without Horns," which appeared in *Unknown*. Top honors go to Page, however. He achieved his affect with two words; it took Miss Moore about a thousand.

Bradbury's story was excellent for a newcomer, but it reminded me very much of van Vogt's "Weapon Shop" and that *Unknown* short "Shottlebop." The idea seemed rather similar.

The other stories were all extremely good. Clement's story was the only exception and still—it was readable. In that, I mean that I do not feel as if the time spent in reading the story was wasted.

In order of preference:

1. "Judgment Night."
2. "Concealment."
3. "Doodad."
4. "Robinc."
5. "Attitude."

The only complaint that I have to make is in the way of illustrations. With Rogers gone, your covers have slipped tremendously. With Schneeman gone, so have your interior drawings. Williams—or Kolliker—is simply ng. Ditto for Orban and Fax. Kramer is so-so. One could hope for eventual inclusion of Virgil Finlay, Leydenfrost, Charles Chickering, or practically anybody else besides the Fax-Kolliker-Kramer-Orban-and-Williams quintuplets.

As a humble request: May we expect Astounding—and likewise *Unknown*—to return to the large-size magazine after the war is over and the paper shortage remedied? At least, here's hoping.—Frank Robinson, 6636 S. Sacramento, Chicago, Illinois.

We would like to know more about it!

Dear Mr. Campbell:

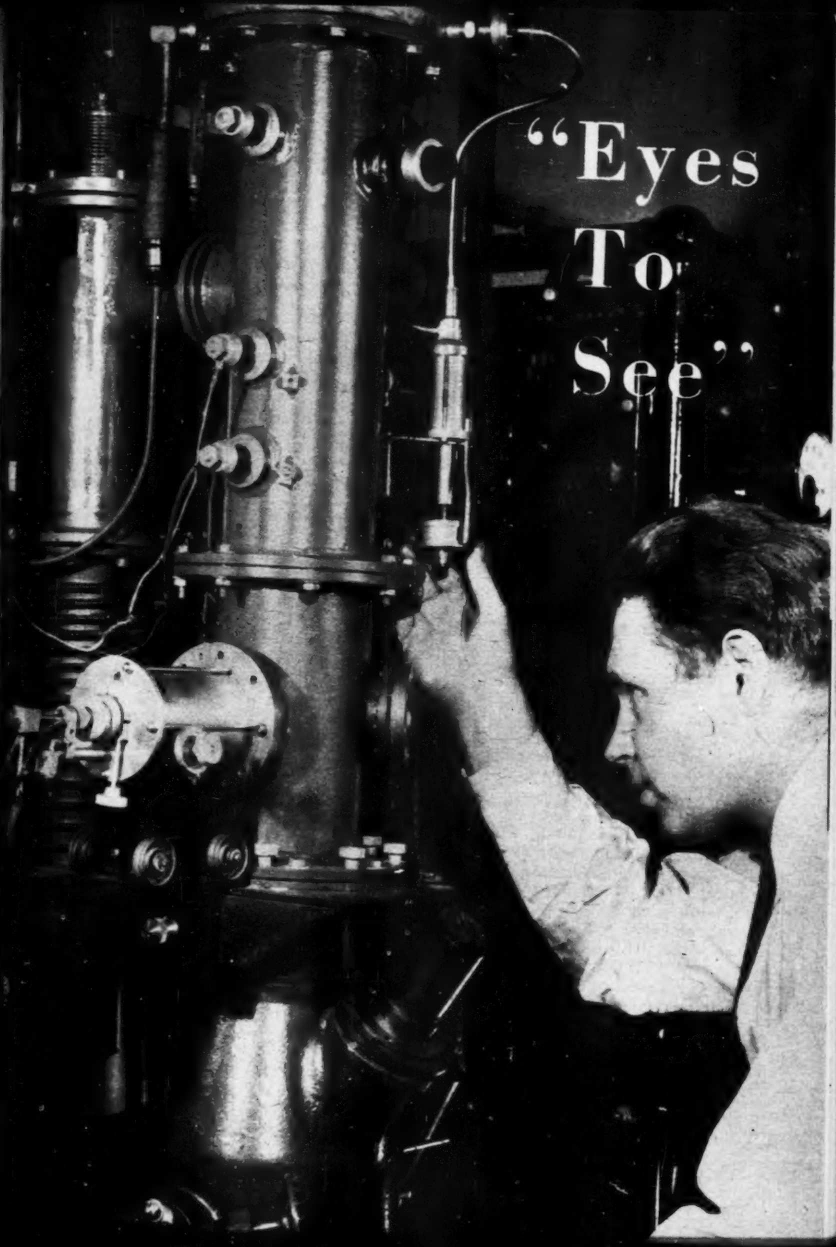
Ratings:

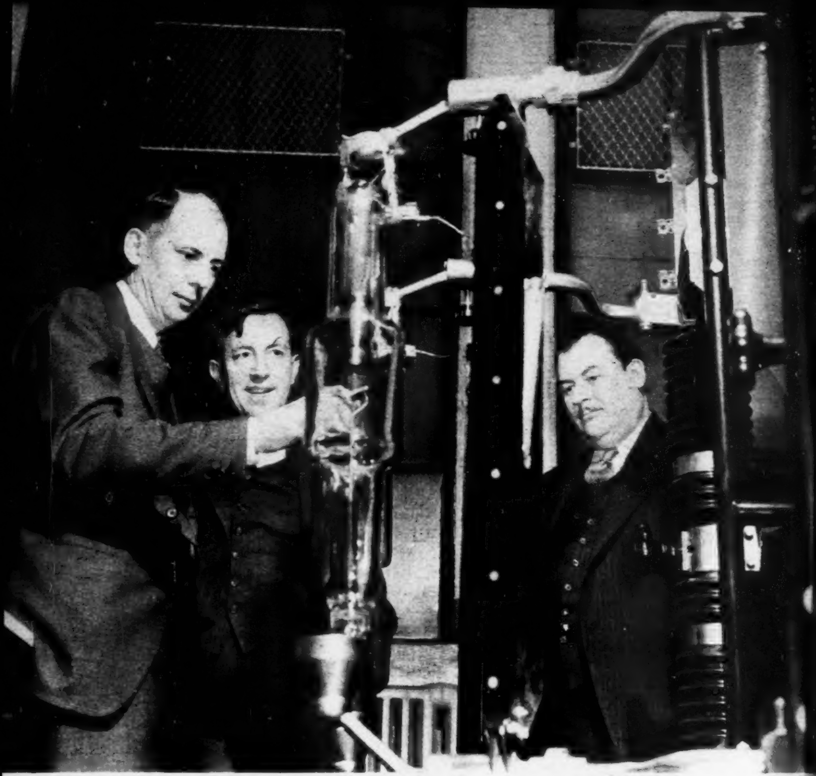
1. George O. Smith's "Recoil."
2. Asimov—the long-lost!
3. Van Vogt—wasn't there any *reason* why they lived forever?
4. "Gallegher Plus."
5. "—If You Can Get It"—just another one of the stories that belong in *Unknown*.

About that yeast—it has been m good (?) fortune to taste some o it. The biochemistry departmen of the University of Illinois trie out some of the Anheuser-Busc product on its students this summe It tastes quite well undiluted—muc like sodium glutamate, which is lik a poor imitation of chicken sou But it is dry and salty, and whe diluted it is rather nauseating. However, it can undoubtedly be improved. As to its effects—none i particular except it increases purin metabolism—i. e., uric acid outpu

I think readers of Astoundin might like to know about this fir nonagricultural food.—John Samue 831 Hamlin, Evanston, Illinois.

"Eyes To See"

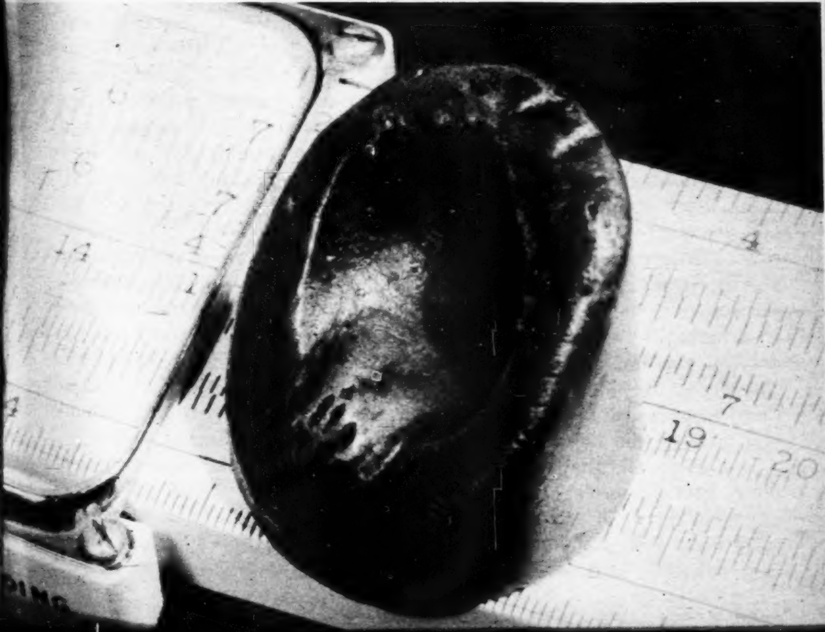




Electronic devices that extend man's range of vision embrace almost the entire known spectrum, and not merely the optical spectrum. Radio is used for vision both indirectly, in transmitting radiophoto services, and directly as an artificial equivalent for Kimball Kinnison's "sense of perception." The infrared spectrum is caught by photocells, or by hypersensitive bolometers, to operate electron amplifiers. The device above is a very special type of X-ray tube developed by Westinghouse; it is, to an ordinary X-ray tube, as an Edgerton Speed-lamp is to an incandescent bulb. The Edgerton Speed-lamp system stores energy in a bank of condensers, then smashes the stored energy through a special type of mercury-argon arc lamp. This Westinghouse development stores energy in a similar manner, and discharges it in one tremendous, extremely brief surge through the high-power X-ray tube shown. The duration of the discharge is so brief, but its intensity so terrific, that X-ray records on photographic film can be made with an effective exposure of one microsecond. Photographs of bullets going into steel armorplate have been made in the past—now X-ray shots showing the bullet during penetration, while inside the steel, are possible.

But electrons are used directly for hyper-vision, too, in the electron microscope. One difficulty of the electron microscope, however, has been the fact that the electronic picture was, essentially, a shadowgraph—the subject under examination was penetrated by the electrons, to show its internal structure. One of the most important fields of modern metallurgy, however, is the study of surface phenomena. Corrosion starts at the exposed surface, friction results when two surfaces are in contact, the still-unexplained phenomena of the barrier-layer type rectifiers and photo-sensitive surfaces are surface, or near-surface phenomena. The electron microscope shown on the first page of this section is another Westinghouse trick—it depends on the bounce of electrons from the surface of the material under examination.

The strange object below (Fig. 3) is not an effort to duplicate Luna's craters—but a remarkably conclusive demonstration that electrons are material particles. One tends to think of electrons as somewhat similar to shadows. You can calculate where the shadow is, what it will do, it has physical reality in an intangible way, you can measure it, predict its appearance and reactions—but it isn't real in a mechanical sense. The electric charge carried by an electron is so stupendous in proportion to its mass—some 100,000,000,000 coulombs per kilogram—that the mass is rather overlooked. But electrons are mechanical realities; this mass of tough, solid copper bears witness to that. Originally, this was an X-ray target, a cylinder of copper cut off by a plane at 45° to its long axis, with a button of platinum inset flush with the angled surface. As a stream of machine-gun bullets would pound a hole in a granite boulder, the 500,000 volt electrons pounded the deep pit in this target. The platinum is completely vanished, save for the small dot of it overhanging the pit at the 11 o'clock position. The protruding tongue, hanging in a sort of limp exhaustion from the target's mouth is copper blown out of the pit by the 400,000,000 mile-an-hour wind of electrons sweeping down into the pit.



Universes to Order

by J. J. COUPLING

IN the universe wrapped up in a bottle that's called a vacuum tube, the controlled flow of electrons perform modern miracles. The trick is to design that universe so that the electrons will flow as desired.

When I first heard of electrons being made to perform desired antics in a vacuum, I learned of it under the name, "electron optics." Maybe this is appropriate in the case of electron microscopes and cathode-ray tubes, in which electrons flow in long, narrow beams and are focused by electron lenses to give images, to pass through tiny apertures, and to form spots on screens. If one draws typical electron paths or trajectories for such devices, the bundle of lines looks just about like the "rays" of geometrical optics, and, in fact, a perfect analogy can be worked out.

But after all, the analogy with optics isn't as close as another analogy that may be drawn. In its most usual behavior, light is waves, not particles, and in their most usual behavior in electron tubes, electrons are particles, not waves. Then, there are electronic devices in which electrons follow paths so complicated in fields so complicated that they would give an optical man the screaming meamies.

In optical devices the rays progress straight from surface to surface. In electronic devices, anything goes. The quantity analogous to the index of refraction is the square root of the potential, and the potential varies smoothly all over the inside of electronic gadgets, just as the gravitational potential does in a gravitational field.

There, I think, comes the real, close analogy. Think of an electron as a spaceship in a strange universe. It's very appealing. Both are motion in a vacuum. A meteor may wreck the spaceship, and a collision with an ion may knock an electron to just where it shouldn't go. But suppose everything goes right. The speeds are high in both cases. An electron falling from rest through a potential of one hundred volts acquires a speed of about three thousand miles per second. An electron traveling four centimeters travels about ten million times its own length, comparable to a spaceship three hundred feet long going a tenth of a light-year. Chiefly, the time scale is different. From an electron, it's all over in a few thousandths of a microsecond.

The problem of navigation is, of course, different. For the spaceship, there's only one universe—except in some S. F.—and the ship is put where the engineer wants it by its own motive power. The electron doesn't have any motive power. It just falls through the fields surrounding it, trying to get to a positive electrode but keeping Newton's laws of motion strictly in mind. And the electron's motion is just through a little bit of very specially designed space: in fact, through a universe of its own. It's the job of the electronic engineer to design such universes, so that the electrons will follow desired paths and get where they should, how they should, and when they should.

For instance, have you seen an electron multiplier? Maybe you've worked with photocells, and know how little current you get from them with quite a lot of light. I don't mean the exposure-meter type, which is something else, but the vacuum or gas-filled type, such as is used in sound pictures, and used to be used in television before the kinescope and iconoscope came along; the kind that will follow rapidly fluctuating lights. And perhaps you've fooled with high gain direct current amplifiers—especially if you happen to be a physiologist—and know how tricky and unstable they are. Or maybe you've found it hard to get lots of gain and lots of bandwidth at the same time.

In a rough way, an electron multiplier makes lots of electrons out of a few, so that milliamperes instead of microamperes come out. And it can follow frequencies up into the megacycles. Out of the window go the complicated amplifiers. You can have home talkies with the multiplier output hitched directly to the power output tube—a really high quality amplifier. You can make a recording photometer or spectrometer without any amplifier at all. Or an electric burglar alarm. And there are discreet rumors that electron multipliers have war applications as well.

Maybe the first commercial photo multiplier—that is, combination of photosensitive surface and electron multiplier—was the gas phototube. In this the space between the negative photocathode and the positive anode is filled with inert gas at a low pressure. When light shines on the photocathode, electrons are emitted. These are drawn toward the positive anode. They hit a lot

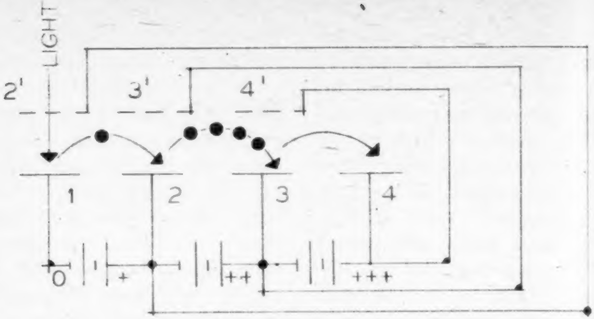


Fig. 1. The magnetically focussed type of electron multiplier curves the paths of the secondary electrons by means of a magnetic field. In this figure, the magnetic field would be at right angles to the page.

of gas molecules on the way, producing positive gas ions and more electrons. Thus, many more electrons reach the anode than started from the cathode.

Two things are wrong with the gas photocell. First, it's a low—audio—frequency device. The heavy gas ions which are formed move slowly, and take quite a while to clean up. This limits the frequency response. Then, suppose you increase the voltage, fondly trying to get harder and more hits, more ions, and hence more electrons and more current. Blooey! That was an arc, and the photocell isn't any good any more.

Quite a while ago someone thought that secondary emission could be used to amplify photocurrents. He knew that when electrons with a hundred or so volts of energy strike a metal surface, other or "secondary" electrons are knocked out. For some surfaces—and oddly and fortunately, from the same cesium-oxygen-silver surface which are used as photocathodes—three or four electrons on the average come out for each primary electron that strikes. Presto, an invention! But it isn't as easy as tha, at least not if the secondaries ar to strike another multiplying surface, and the secondaries they produce strike another surface, and s on, so as to get lots of gain.

For instance, think of this one. An electron leaving a given electrode must strike an electrode at higher voltage, so as to gain speed and energy. But *at the same tim* the electric field at the point a which the electron strikes must b *away from the surface* so that th secondary electrons which are pr duced will be urged away from th surface and on toward the next ele

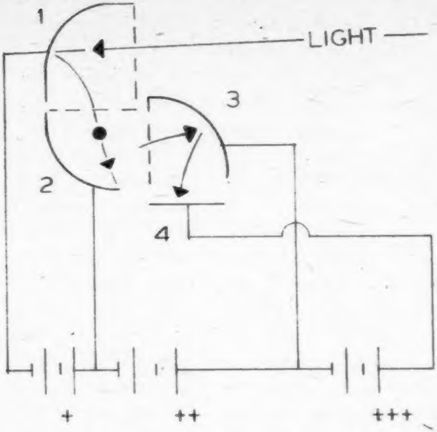


Fig. 2. The Farnsworth electrostatic focussing system eliminated the need of the heavy, bulky, and extremely critical magnetic adjustments.

trode. Some early inventors got only the first point, and the patent office didn't catch them. There are patents on inoperable multipliers with secondary emitting surfaces nicely surrounded by negative focusing electrodes which would turn the hardiest progeny of a primary electron right back to where it started.

There's the rub. So that the electrons may strike the secondary emitting surface forcibly enough to produce secondaries, they must be urged *toward* the surface. So that the secondary electrons, which leave the secondary emitter with very feeble velocities, may not fall back, they must be urged *away* from the surface. Is it possible?

Of course it is possible; all that is needed is a little ingenuity. One of the first ways this was done, by Zworykin, Morton, and Malter*, is shown in Figure 1. We might call this Universe Number 1.

In this universe, the photo surface and the secondary emitting surfaces are a number of strips, 1, 2, 3, 4 in the figure. These are at successively higher potentials: say, 2 is 100 volts positive with respect to 1, 3 is 100 volts positive with respect to 2 and hence 200 volts positive with respect to 1, et cetera. Since the energy an electron acquires in going from one electrode to another is given by the voltage difference between the electrodes, an electron leaving electrode 1 will strike electrode 2 with 100 volts energy—remember the

---

* V. K. Zworykin, G. H. Morton and L. Malter, Proceedings of the I.R.E., Vol. 24, No. 3, March, 1936.

3,000 miles per second? Then the secondaries leaving 2 will strike 3 with 100 volts energy, and so on. Thus we have succeeded in urging the electrons toward the proper electrodes. How to urge them away is the next question.

To do this we put electrodes 2', 3', 4' opposite electrodes 1, 2, 3. Then 2' is attached to 2, 3' to 3, and 4' to 4. Now if nothing further were done, electrons leaving 1 would simply go directly to 2' and those leaving 2 would strike 3'. What we do is to add a magnetic field perpendicular to the plane of the drawing. An electron moving in this field is urged to the right with a force proportional to the electron's velocity. By making the field have just the right strength, the electrons and secondaries can be made to have just the paths shown in Figure 1.

With devices of this type we get multiplications of several million, so that an initial current of a hundredth of a microampere can produce an output of tens of milliamperes, sufficient to operate sensitive relays of power amplifier tubes.

Does this triumph solve our problem completely? Not at all! Scientifically, the device is satisfactory, but in an engineering sense it leaves much to be desired. The

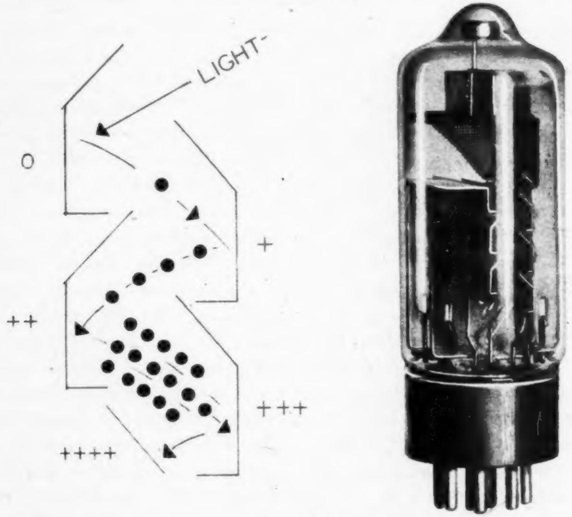


Fig. 3. Left, *the folded-universe type of multiplier, electrically more complex, is mechanically simpler, easier to manufacture accurately, and suffers less distortion due to space-charge.* Right, *a Western Electric phototube multiplier using this type of design.*

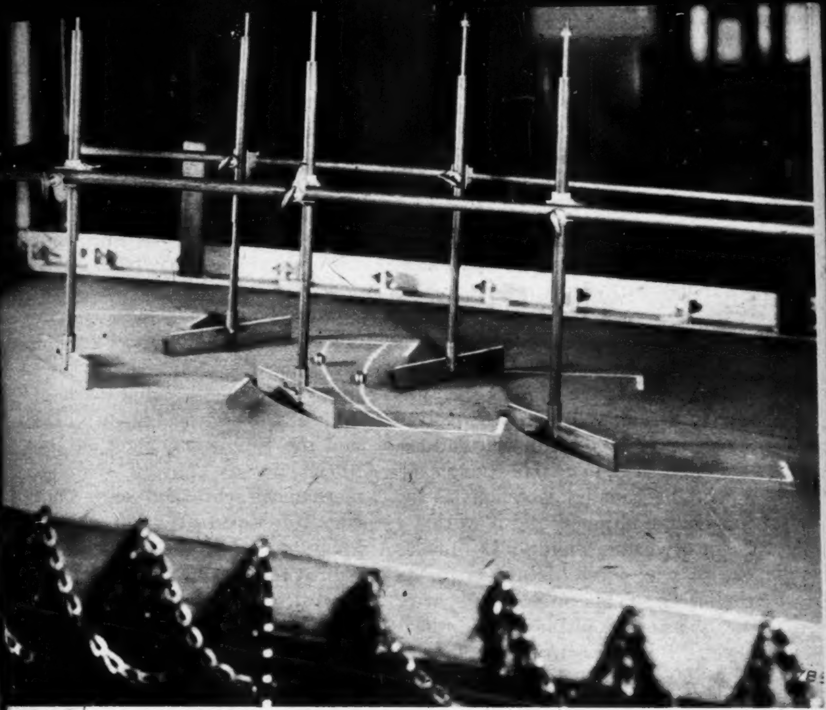


Photo from Bell Telephone Laboratories.

The rubber-sheet model of the folded-universe, with ball-bearing "electrons" accurately reproducing the movement of actual electrons in the tube.

magnets are heavy, bulky, and have to be lined up carefully. Too, the proper operation of this gadget depends on exactly the correct ratio of electric and magnetic fields. If the voltage is raised just a little without readjusting the field, the electrons overshoot their mark. If it is lowered, they fall short. The magnetically focused multiplier is just too blamed critical and cumbersome.

So we try to get rid of the magnetic field. Genius Philo T. Farnsworth, the inventor of the image dissector, and of numerous radio frequency multipliers and secondary emission oscillators which don't fit into this story, made one of the first satisfactory purely electrostatic multipliers. Maybe Farnsworth wasn't trying to improve on the magnetic multiplier, but was trying to make a substitute for his radio-frequency devices. Anyway, he produced a d-c multiplier which needs no magnetic field.

Now this is difficult. In the magnetic multiplier, the force produced by an electron moving in a magnetic field is used to bend the electron's path toward the secondary emission surface, despite the electric force away from that surface. Taking away the magnetic field means trouble. We've lost the obvious means for doing the job. We're afraid we'll become involved in all sorts of difficult calculations. Farnsworth didn't. He thought of something equally as obvious as the magnetic multiplier, and it works.

Farnsworth's multiplier makes use of wire mesh. Now as far as the electric fields produced go, wire mesh is just about like a solid metal sheet. But if electrons are shot at it, most of them go through. Farnsworth combined this mesh with secondary emitting plates to make an entirely electrostatic universe. Universe Number 2, the Farnsworth multiplier, is shown in Figure 2.

Here the electrodes consist each of a solid curved secondary emitting portion and a grid of mesh attached to it. A photo electron leaving electrode 1 is urged toward the grid of positive electrode 2. When it passes through, it is, of course, urged toward electrode 3. But electrons, like spaceships, can't execute sharp turns when they are going fast. So the electron strikes 2. The secondaries are urged toward 3, and the subsequent events are obvious. It will be noted that in this universe, we have fulfilled the two necessary conditions; the electrons leaving a given electrode reach an electrode at a higher voltage, and the electric field at the point they strike is such as to urge electrons away from the surface.

Now Universe 1 and 2, the magnetic multiplier and the Farnsworth multiplier, have one feature in common. Anyone familiar in a general way with the laws of motion and the forces acting on electrons, or let us say, anyone with good mechanical sense and some knowledge of the forces on electrons, knows at once that these devices will work, just by looking at them. No calculations are necessary.

There is another type of multiplier, an electrostatic multiplier with no meshes, which is not so obvious. Now, getting rid of the meshes makes the device simpler and more efficient. But with the mesh gone, you can't say for sure just by looking at a picture whether or not the multiplier will operate. For instance, look at the multiplier shown in Figure 3, our Universe Number 3. The battery connections aren't shown, by the way. We can guess pretty well by looking at Figure 3 that one condition is fulfilled; if the electron paths are as shown, the electric field does urge the electrons away from the surfaces, for opposite each striking point is the projecting edge of a more positive electrode. There

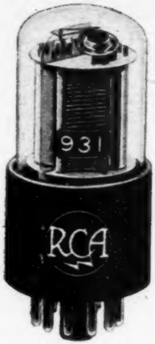
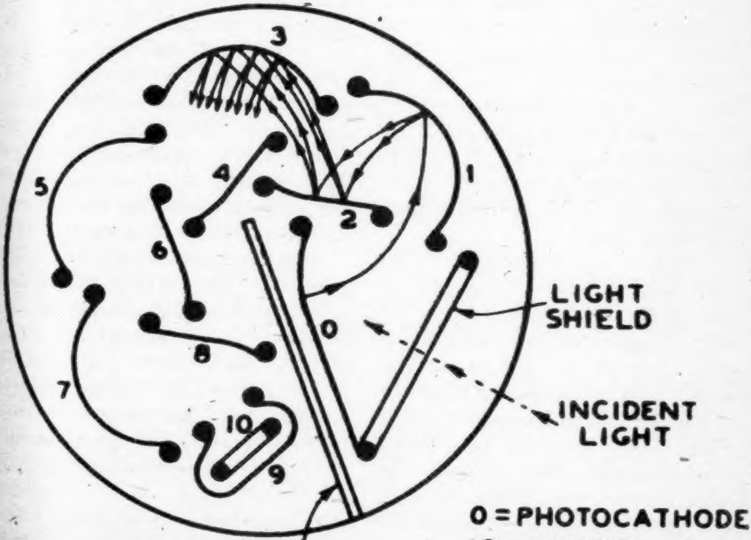


Fig. 4. Below, *the "crumpled" universe, carrying the folding still further, produces a fantastically complex electrostatic field structure that is highly ingenious in its use of oddly, carefully shaped electrodes to force the secondary electrons into predetermined paths.* Left, *the RCA 931 phototube which uses this structure is extremely compact. The base of the tube is the same size as the base of the ordinary radio tube.*


3
1
2
4
5
6
0
8
7
10
9
LIGHT SHIELD
INCIDENT LIGHT
MICA SHIELD
0 = PHOTOCATHODE
10 = ANODE
1 - 9 = DYNODES

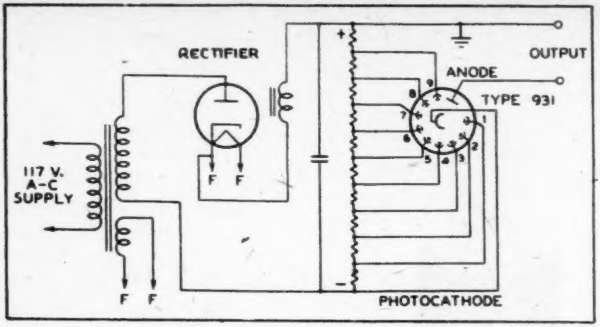


Fig. 5. The type of circuit used with the electron multiplier. A multitapped transformer can replace the voltage dividing resistor network, since the phototube is capable of rectifier action.

are, too, a succession of increasingly positive electrodes. But how do we know that an electron leaving the flat, vertical portion of 1 will not strike the projecting edge of 3? Or the projecting edge of 2? Or will not fall down the center of the device and strike 5? We don't, unless we have some way of tracing the path of an electron in such an electric field.

Perhaps the uninitiated need some assurance as to the gravity of this problem. Suppose we tackle it by strictly pencil and paper methods. Except in certain special cases, it is extremley difficult to obtain analytic expressions for the fields about electrodes of complicated shapes. But suppose the fields were known. Obtaining electron paths analytically would be almost impossible.

Enter the mechanical brain. We need some sort of calculating machine which will enable a relatively unintelligent worker to solve this problem. In fact, if the problem is to be solved, some such machine must be used. But don't think of whirling wheels and brightly glowing vacuum tubes. Think of an engineer rolling little ball bearings down a sheet of rubber, and looking awfully foolish to glass blowers who make disparaging remarks.

Two-dimensional fields are fields such as occur between electrodes which are long and straight in one direction—say perpendicular to the plane of the paper in Figures 1 to 4. Now there is a strict analogy between two dimensional electrostatic fields and small displacements of a stretched membrane. Such a membrane may be a tightly stretched sheet of thin rubber. Let us compare (1) a tightly stretched horizontal membrane; (2) a two-dimensional electrostatic field.

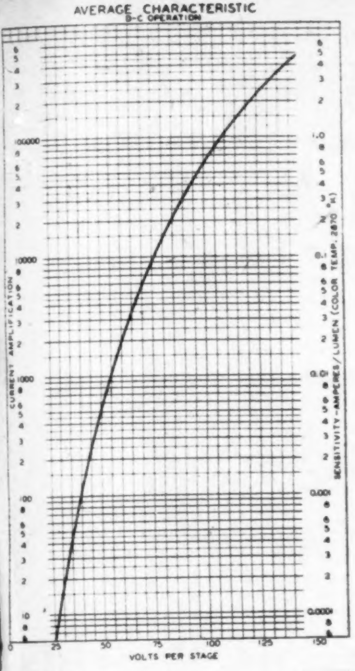


Fig. 6. The variation of amplification with variation of voltage between electrodes. With 125 volts per stage, 1250 volts over all, the 931 gives an amplification of about 250,000 times. Compare this with the 1000-fold gain of a high-amplification radio tube.

Membrane	Field
Height	Potential or voltage
Slope	Electric field strength
A level support holding membrane at a certain height (maybe a board or block)	Equipotential, such as metallic electrode at a certain voltage

In an electric field, an electron experiences a force proportional to the electric field strength. A ball bearing placed on the surface of a membrane experiences a horizontal component of force proportional to the slope of the membrane. The electron has mass and so does the ball bearing. Aside from certain small effects, a ball bearing rolling on the surface of a slightly displaced membrane will follow just the same path as an electron in the analogous two-dimensional field. So the engineer rolls little balls down a rubber sheet, however silly he looks to anyone else.

This means of design has been described in the literature* with pictures showing the balls rolling, and that's how the electrodes shown in Figure 3 were designed.

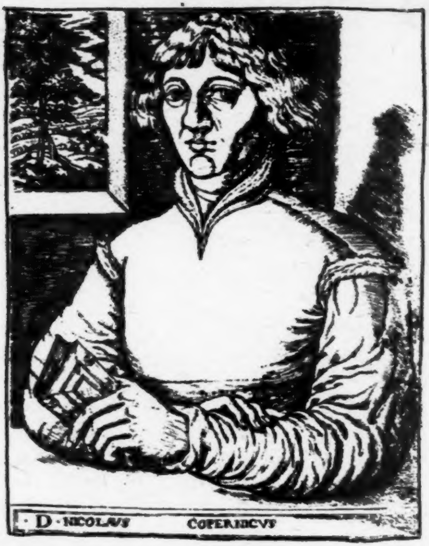
A final refinement may be added. The structure shown in Figure 3 becomes long when many stages of multiplication are used. Why not curl it up? And that has been done, giving the structure shown in Figure 4.

If you want to study the laws of space travel, don't go into astronautics. You may have to wait too long. Try electronics right now. The spaceships are free, and you can design your own universes. Or you can when rubber sheeting is available again.

---

* J. R. Pierce, "Electron Multiplier Design" Bell Laboratories Record, Vol. XVI, No. 9, May, 1938, also V. K. Zworykin and J. A. Rajchman, "The Electrostatic Electron Multiplier," Proceedings of the I.R.E., Vol. 27, No. 9, Sept., 1939.

THE END.



The Plurality of Worlds

by WILLY LEY

***WHEN** philosophers of earlier times discussed "other worlds" they meant more or less what we would mean by "other continua". Some of the strange conceptions of the universe they had were wrong in fact, but came surprisingly close to fitting observed data.*

The discovery of the world of 61 Cygni C is one of the great astronomical discoveries. It is greater even than the discovery of the four large moons of Jupiter by Galileo Galilei, greater than the discovery of Uranus by William Herschel, and well comparable to the mathematical discovery of Neptune by Leverrier and Adams.

But it has additional importance importance beyond the realm of astronomical science. Aside fro being an astronomical discovery is also the last—and decisive— round in the aftermath of a phi sophic battle which raged well over twenty centuries.

This sounds complicated.

It is!

The problem which caused this long and bitter fight goes under the name of "plurality of worlds". It is about as old as astronomy itself, but not quite. During the earliest period of astronomical history the problem of the plurality of worlds was no problem at all, for the very simple reason that a conception of possible other worlds did not exist.

The earliest astronomers about which we know are the Babylonians. Aided by almost perfect atmospheric conditions the priests of the old cities became excellent observers. They learned to recognize the patterns of the distant suns, arranging them in "constellations" and they learned to trace the paths of those few "stars" which were not part of any constellation but moved across the sky: the planets. More, they learned to predict events in the sky, the first predictions which were not prophecies but information about the future. They learned, for example, that there was a cycle of two hundred twenty-three lunations or of eighteen years and eleven days, after which the Moon returned to precisely the same position in the sky. (Precisely means, of course, as far as naked-eye observation can tell.) They even discovered the precession of the equinoxes.

But with all this they never thought of the lights in the sky as sizable masses of something. The stars, especially the planets, were abodes of The gods and as such probably immaterial. At any event it seemed good *not* to speculate about their nature. It was the priest's duty to know their movements, but not more.

The same, with obvious modifications, can be said about ancient Indian and ancient Chinese astronomy, too. There was no problem of the possible "plurality of worlds" because the world was obviously one, consisting of the soil underfoot and the firmament overhead.

The flat-Earth conception held sway in early Greece, too, and there are two nice bits of evidence that show how the one conception precluded.

One is Homer's *Odyssey,* or rather that part of it—the books IX-XII—which the Frenchman Victor Berard called the "Tales of Odysseus at the Court of King Alkinoös". Everything happened to Odysseus during the ten years of his adventurous journey: sirens and goddesses, man-eating giants and sea monsters, storms and whirlpools. But from a certain point of view it is more important what did *not* happen to Odysseus,—the omission proves that the legend in question did not exist when the *Odyssey* took its final shape which must have been sometime between 600 and 700 B.C. The hero did not, for example, encounter the Mountain of Lodestone, his vessel was not caught in the "jellied sea", he did not kindle a fire on the back of a dozing *Kraken,* he did not meet the Flying Dutchman on the high seas.

Nor was Odysseus' vessel caught by a storm and carried to the Moon.

The necessary prerequisite for this adventure, the conception of the Moon as a separate world, did not exist. We don't know precisely what the Greeks of Homer's time thought of the composition of the Moon. But Pliny the Elder, and that is another piece of evidence, preserved for us a conception which must date back to that time. Pliny does not even know the name of the originator of what even he considered an old idea.

That idea was that the Moon was a polished disk of silver. As for the spots there were two explanations. One was that they are not real but reflections of the continents and oceans of Earth, an explanation which was acceptable as long as terrestrial geography was limited to a small corner of the Mediterranean. The other explanation said that the spots were just dirt which had accumulated there from the "vapors" ascending from Earth.

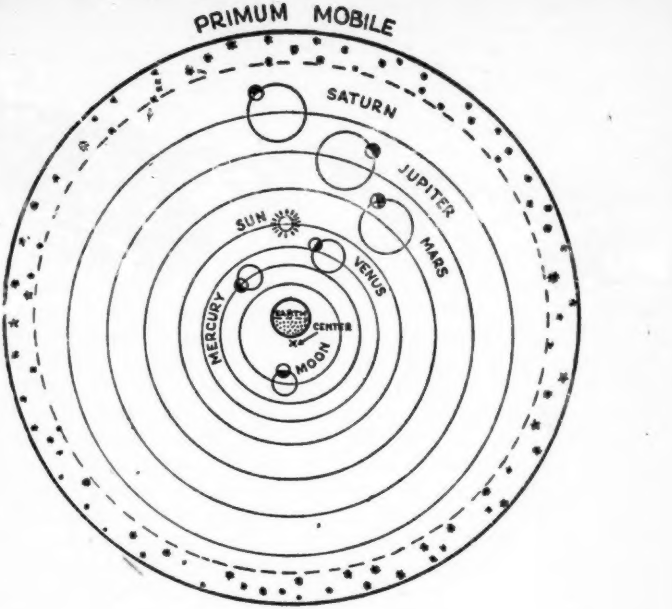
But then the Greeks conceived the Earth to be a sphere freely poised in space. The next question was, naturally, whether the lights in the sky were such spheres, too.

Even before things had quite progressed to that point one of the early philosophers, Anaxagoras, had startled the court of Pericles by asserting that the Sun might, after all, be larger than the whole mainland of Greece. The same Anaxagoras, it is said, ascribed an "earthy nature" to the Moon. The result was speculation about that "second earth" based on the apparently equal size of both Sun and Moon. If they were of about equal size, the Moon also would be as large as the mainland of Greece—and that looked very large to the people of those times.

At this point it may look as if the whole problem developed along a straight and obvious line. One, it may be reasoned, thought that the Moon was another Earth, another suspected it about Mars and Venus, a third added Jupiter and Saturn and a fourth wondered about the stars.

It was believed much later that the development of that thought had followed such a line and the Frenchman Camille Flammarion who around the middle of the last century wrote two very fat books on that problem tried to develop such a case. He as well as his German imitator Felix Linke have made much of "the firm belief of Greek philosophers in a plurality of inhabited worlds." As Linke—Flammarion is much too voluminous to be quoted and translated conveniently—has it in one of his books:

> Most philosophic sects taught that the stars are inhabited, even if not always openly. For example Thales (640-550 B.C.), the founder of the oldest Greek



In the Ptolemaic system, which ought to be called the Hipparchis system, Earth formed the center of the universe, but not the center of the circular planetary orbits. The planets did not run on those circular orbits either, but on so-called epicycles or "minor circles", the centers of which ran along the major circles. While factually wrong, this system was a good representation—in a geometric sense—of the observed movements, as well as it was possible to determine those movements without a telescope. The stars were supposed to be distributed through a zone surrounded by a crystal shell. Few early philosophers put the stars on the crystal shell itself. When philosophers spoke of "other worlds", they did not mean other planets as we do but meant other systems like this one—other universes.

philosophic sect, taught that the stars consist of the same kind of matter that forms the Earth. His pupils as well as Leukippus (about 500 B.C.) and Aristarchus of Samos (about 264 B.C.) taught the same. The great Pythagoras (540-500 B.C.) openly taught the fixedness of the Earth and the movement of the stars

around it, but informed his initiated pupils that the Earth is a planet and that there are several inhabited earths. Petronius of Himera in Sicily taught that there are one hundred eighty-three inhabited worlds. The strange figure one hundred eighty-three was arrived at by assuming that the world was a triangle, with one world at each corner and sixty worlds along each side.

Well, things are not as simple as that and for two main reasons. One is that no direct evidence for any of these statements can be found. These statements do not come from the writings of the men quoted, they are taken from later writers making passing references to them. These writers did not only live several centuries later, they did not have original manuscripts either. Instead they quoted others whose works are also lost and often enough those others had quoted somebody else. On top of all that the writers of those books we do have are often in opposition to the ideas mentioned. The most important source is a book known as "Philosophumena," written during the second quarter of the third century A.D. The writer was one Hippolytus—not Origenes as was believed for literally one and a half millennia—who quotes older ideas about the plurality of worlds and the infinity of space as heresies which are to be condemned.

As if this doubtful literary tradition were not enough of a handicap a change of the value of certain words has to be kept in mind, too. When we say "world" we usually mean "Earth". When we say "other worlds", we mean "other planets". When they said 'world", using the equivalent term of their language or languages, they meant something else. It did not always mean the same, but it always did mean more than the planet Earth. It meant a whole Ptolemaic system, to use a modern word which describes approximately what they had in mind. It meant the Earth with the Sun and the Moon and the other planets—not recognized as sisters of Earth—and an array of fixed stars around the whole, probably wrapped up in an impenetrable outer shell. 'World" meant a planetary system with the Earth in the center and a starred sky boxed for storage in the universe. "More worlds than once" meant several such sphere-inclosed systems, not several planets.

So the discussions about a plurality of worlds referred to the probability or improbability of several Ptolemaic systems.

Supposing now that two philosophers agreed that there were several world packages in space, they still did not agree about distribution and contents. The more conservative crowd assumed that the "world" could have only one shape, that in knowing our "world" we knew all of them. According to that opinion the various worlds were as identical, had to be as identical, in their contents as so many boxes of chessmen. The same group also tended to believe that the distances between the worlds, i. e. the outer shells, were uniform.

Others were radical and negated any kind of uniformity. If that later writer Hippolytus can be trusted, Democritus said that the various worlds "differ in size, in some is neither Sun nor Moon, in others both are greater than with us, and yet in others more in number. The intervals between the worlds are unequal, here more and here less."

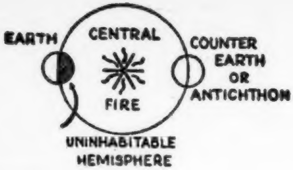
While this was going on among some groups, the Pythagoreans developed their own ideas. Their main invention was the *Antikhthon,* the counter-Earth. They needed it to bring the number of "planets" up to ten and they constructed a world with a central fire in the middle. The Earth moves around that central fire which, of course, makes one of its hemispheres uninhabitable—that happened to be the Western hemisphere. On the other side of the central fire is the *Antikhthon,* also rotating around it, also with one unihabitable hemisphere. The Sun is merely the reflection of the central fire. The counter-Earth, since it was a counter-*Earth,* was probably inhabited. But all this was a private idea of the Pythagoreans, scorned by the others.

Those others, however, began to wonder about another kind of "plurality". If they admitted that there were more "box-worlds"—and even if they didn't—they began to wonder whether inside that box there might be other worlds similar to Earth. They almost universally agreed that there was at least one, the Moon and around 100 A.D. Plutarch wrote a book about that question, the first book devoted exclusively to just one other celestial body. Plutarch came to the conclusion that the Moon was a smaller Earth, inhabited by the spirits of the dead. The latter is to be taken as a matter-of-fact statement, not as a weird fantasy.

Some sixty years later the Greek satirist Lucian—properly: Lukian—wrote the first story of a Moon journey, called "True Story" and usually quoted under its Latin title of *Vera Historia.* Here the adventure that was lacking in the *Odyssey* does take place, outside the Pillars of Hercules a ship is caught by a storm and carried to the Moon. The voyagers find that it is a land like the Earth, inhabited by all kinds of strange creatures, lorded over by King Endymion. Unfortunately the king is just at war, with the king of the Sun.

The "plurality of worlds" had established itself definitely.

But otherwise the Ptolemaic system ruled, as Hipparchus had established it some two hundred fifty years before Claudius Ptolemaeus after whom it is named. The Earth was in the center, Sun, Moon and planets revolved around it and at the edge there was a zone of fixed stars, a zone of considerable depth, bounded by a crystal sphere. It became the official picture of the world, until Nicholas Copernicus, in 1543, placed the Sun in the cen-



The Pythagorean World had to have ten planets since ten was the sacred number of the Pythagoreans. They invented an "Antichthon" or Counter-Earth, revolving around the Central Fire to balance Earth.

ter, Giordano Bruno negated the existence of a crystal sphere and Johannes Kepler finally replaced the old circles and epicycles which Copernicus had not touched by the elliptical orbits we know to hold true.

This, at least, is the way the development is usually told. But during the thousand years prior to Copernicus the "plurality of worlds" had an interesting history which is always sadly neglected. The official point of view was that of Aristotle who had taught that there could be only one world—in that respect as in many others Aristole was far behind even his own times. It is the one inexplicable mystery of the development of human thought why anybody ever considered him as important as he was considered.

Hippolytus, in about 240 A.D., had rejected all ideas of plurality as heresy. Roughly three centuries later the ecstatic Kosmas, a monk who traveled far, as far as India and hence called himself Indicopleustes, asserted that even the sphericity of the Earth was heresy. The Earth was a flat square with a high mountain in one corner, around which the Sun traveled, sometimes higher and sometimes lower, which accounted for the seasons. And Kosmas and others of his ilk must have had a great influence. It is reported that Virgilius was removed from his bishopric and excommunicated in 748 A.D. for believing in the existence of another world and another humanity, and that was not even another world like, say, Mars. The Latin wording which speaks of *alius mundus,* and *alii homines sub terrae sint,* indicates that it was simply the belief in the existence of the Western Hemisphere and its presumed inhabitants.

The general credo was that there was only one world. But that credo was not without opposition and the opposition had a potent weapon indeed: the Plenitude of God. God, after all, was not restricted and if one were a heretic one might think that the credo of only one world contradicted the first and most important dogma of God's Plenitude. At first the problem was solved in a simple manner, in 1145 Franciscus Gratianus issued a *decretum* which declared the belief in more than one world to be heretical.

After the decree was issued it was felt that it should be explained and William of Auvergne, near the end of the Twelfth Century, furnished the explanation. It was not a question of God's omnipotence at all, nor a lack of Plenitude. It was simply this: God is able to make, but Nature is unable to be made!

All the great men of the Thirteenth Century set out to make it clear why there was only one world in spite of God's Plenitude. Albertus Magnus emphasized the importance of the question, calling it "one of the most noble and exalted questions in the study of Nature." He answered the question in affirming that there was but one single world. So did the *Doctor mirabilis* Roger Bacon, so did Vincent of Beauvais and so did the *Doctor angelicus* Thomas Aquinas.

His great *"Summa Theologica,"* the writing of which was begun after 1265, is not the only one of his works dealing with that question but it is the one that contains the most decided point of view. The unity of God proved the unity of the world to him. If other worlds existed, they could be of only two kinds, similar to ours or dissimilar to ours. If they are similar, they are in vain which is not in keeping with Divine Wisdom. If they are dissimilar, they cannot contain all things as ours does, they would, therefore, be imperfect which means that they cannot be, since the Creator is perfect.

Thomas Aquinas died in 1274—and three years later his point of view, which was that of the *Decretum* of 1145 was officially repealed! In 1277 Etien Tempier, Bishop of Paris, with authority granted by Pope John XXI, officially condemned the proposition that God could not create a plurality of worlds, Plenitude and creative power must be unlimited.

After that all the others could talk, among the many names only a few may be mentioned. St. Bonaventura spoke in favor of a plurality of worlds. So did Richard of Middleton. Some who were still clinging to Aristotle's argument that the heavy earths would all come together in the center got the answer that the earths would remain where God put them. It was important that the great Nicolaus da Cusa—Cusanus—was in favor of plurality. In his voluminous *"De Docta Ignorantia"* he not only affirmed that the Earth turns around its axis, he not only stated that there *could be* infinite numbers of earths, but he said that there *are* many earths.

Roger Bacon, in defending the opposite point of view, had really done a disservice to his side by quoting the Arab Alfraganus at length in his *"Opus Maius"*. Alfraganus had made some guesses about the fixed stars. Those of the first magnitude, he said, are one hundred seven times the size of the Earth, while even the smallest stars of the sixth magnitude are still larger than the Earth itself. That was, of course, an intriguing thought which should have remained buried.

The Church, as a matter of fact,

did not maintain a definite dogma about the question. Among the early printed books, permitted by the Church, there is a kind of encyclopedia which contains extensive summaries of all the pros and cons, permitting anybody who could read to make his own choice. The Church did not turn against the doctrine of plurality until Copernicus and Kepler connected plurality with the conception of a moving Earth. And even then it required considerable prodding from astrologers and philosophers of the old school who refused to learn new lessons. Nicholas Copernicus' book was put on the Index in 1616, more than seventy years after its initial appearance. It was removed in 1835.

Meanwhile astronomy had progressed in an almost miraculous manner in the countries North of the Alps. It was during just that interval that the true size of the Solar System, the velocity of light and the size of the planets were established. There was no doubt any more that there were several worlds. The nature of the fixed stars as suns had also been established and speculation set in whether they, too, had planets, planets with animal and plant life and possibly even intelligent inhabitants, to accompany them.

The philosophic ideas of Immanuel Kant hinted at that conclusion and Pierre Simon Laplace, reworking some of Kant's ideas, then arrived at the famous theory which came to be known as the Kant-Laplace theory and which seemed to prove that every sun *must* have a family of planets. There was an enormous difference in attitude, every sun was believed to have its planets and it was taken for granted that every planet which was neither too hot nor too cold was bearing life and that every life-bearing planet, provided it was old enough, was bearing intelligent life. Nothing illustrates this attitude better than the so-called *Prix Guzman*, established by Madame Guzman in Paris near the turn of the century.

It was a prize of about twenty-five thousand dollars which was to fall to the man or woman who would be the first to establish communication of any kind with intelligent inhabitants of another planet. *But,* it was stipulated, the award did not include communication with the inhabitants of the planet Mars, because that would be "too easy".

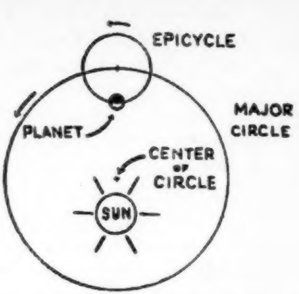
We now know that there was a little too much optimism around in the intervals between 1877—the year in which Asaph Hall discovered the two small moons of Mars and Giovanni Schiaparelli discovered the *canali*—and astronomy in general has withdrawn to more securely established positions. The interesting part is that some experienced such a psychological reaction that they carried the withdrawal much too far, re-establishing, in fact, the pre-Copernican conceptions as far as the problem of "plurality" was concerned.

Of course nobody denied that

the other planets were similar to Earth in size and composition, although within rather large limits. But theoretical deduction led to the assertion that, first, only Earth of all the planets of our solar system is inhabited by intelligent beings and that, second, our solar system is likely to be the only one in the universe.

It is well known how the latter assertion came about. The Kant-Laplace theory had failed to account for the existence of planets. It was replaced by the encounter theory or rather encounter theories since there were several of them, claiming that planets could only be born in a close encounter of two stars. This made solar systems rare, although there are very many stars that are separated by enormous distances, you could not expect many close encounters to take place in a given interval of time, say a hundred million years. Even if you multiplied it by twenty, the probable age of our galaxy, the figure was still small.

Then it was found that a star encounter alone was not enough. It had to be an encounter in which one of the two bodies was double in itself, an encounter between a star and a binary. That reduced the number of probable successful encounters even more and slashed the number of solar systems in half on top of that. Under the ordinary encounter theory each one of the stars would get a solar system, two families of planets would be produced in every encounter. Under the new rule which required a binary only, one of the participants would acquire a family of planets. Solar systems had to be very rare if that was accepted, but there still was not quite sufficient reason to assert that there was only one, our own.



The system of Copernicus was really only a reversal of the older conceptions. Copernicus retained the epicycles—minor circles carrying the planet—and placed the Sun off center. Outside the zone of the fixed stars there was still a shell. The shell was eliminated by Giordano Bruno while Johannes Kepler got rid of the epicycles by putting the planet on an elliptical orbit with the Sun at one of the focal points.

But that assertion was made, and in a certain way everything was right back at the beginning. Aristotle had had the primitive thought that everything that existed outside the Earth existed solely to serve the Earth. Later Christian doctrine at least added a reason for that belief, by making the Earth the center of creation and everything else just useful ornamentation. The modern Aristotles asserted that Earth—and the other planets—were the result of a freak accident which took place only once. And they added to this statement the other one that none of the other planets of our solar system seems to be inhabited. The latter is, as far as we can tell, probably correct, but everything taken together was old philosophical groping in a new disguise. Anthropocentrism had made a glorious comeback. The modern Aristotles had every reason to be proud. They were thinking beings and it looked as if they were the only thinking beings in our whole galaxy.

It was bad upbringing for a century which is likely to end up with the invention of the spaceship. But there it was and there was not much one could say about it.

61 Cygni C has ruined the modern Aristotles, who tried to save their position in saying that that was not a planet. But, according to all the definitions of a planet it is one and it is only natural that it is a very large one, too large to be useful for life. It is only natural in the same sense in which it was only natural that the first fossils that forced attention to their existence were not tiny crabs or the small bones of the dawn horse, but the substantial tusks and femurs of various elephants of the glacial period.

Meanwhile another extrasolar planet has been discovered, which, including our own Sun, makes three neighboring suns with planets. The logical conclusion would be that the binary-encounter theory must be wrong, but there is not even any need for such a logical conclusion because it has been shown in the meantime that it is wrong from the physicist's point of view. The result of that proof was that the last theory about the origin of a planetary system fell under the axe of mathematical investigation without having a substitute of any kind. At present we simply don't know how a planetary system originates.

It is soothing balm on this intellectual wound that we now know that there are at least three of them, under such conditions that logic forces us to conclude that there must be many more. Kant-Laplace, although they were wrong as far as the mechanism of the thing was concerned, were probably right with their conclusion: that the birth of planets is essentially noncatastrophic. And that it is in all probability a natural function in the life of any star.

We'll have to find out how and why.

But in the meantime we may be grateful to 61 Cygni C and its discoverer for a fact which killed off a new philosophy which might very well have been the road to the same blind alley in which astronomy found itself for more than a millennium.

THE END.

The Anarch

by MALCOLM JAMESON

The ideal of totalitarianism is the elimination of all individual initiative. Suppose that ideal were somehow attained. With no one, anywhere, wanting to revolt—

Illustrated by Williams

It was a death paper.

Medical inspector Garrison shifted uneasily in his chair and stared at it. It was all wrong. It was on pale-green paper for one thing, and it had been altered. Down near the bottom where there was a place for a date and a signature, the word "Discharged" had been xxx'd out and "Died" supplied.

"Look here, Arna," he said to his scribe, "this won't do. This . . . er . . . ah. . . . Leona McWhisney was admitted only last week . . . neomalitis, the diagnosis says . . . treated with sulfazeoproponyl, and due for discharge tomorrow. Treater Shubrick has scratched out the discharged and put in 'died.' That's absurd. People just don't die of neomal."

"*She* did," replied Arna primly. "Here's the morguemaster's receipt."

Garrison took it and frowned. Not only did she give him the morgue slip, but the report of the autopsy as well. The McWhisney woman's dead arteries had been found to be crawling with neomal bugs—and nothing else. It was a hard fact to face, and he did not want to face it. He couldn't face it. It was Earth-shaking, outrageous, impossible. It could not be reconciled with anything he knew. It put him in an awful hole.

"But look," he insisted, "we can't use the green form. That's the one for case histories of nonfatal diseases, and the Code classifies—"

"I know," she snapped, "neomalitis is a Category N malady, a mild, easily controlled undulant fever. I looked it up. Article 849 of the Code says Category N must be reported on the green form. That is what I have done."

"That is not right," he growled, glaring at the offending sheet of paper. "If the woman died, it has to be reported on an authorized death certificate. Anyhow, we are not allowed to change any form. Not ever. It means a lot of demerits for both of us."

She sniffed. She knew that as well as he. She had been struggling with the problem for two hours, and her desk was littered with volumes of the bulky Medical Instructions—those bits of the Grand Code by which they lived and which prescribed their every act.

"All right," she said coldly. "You select the right form and I'll fill it out."

Medical Inspector Garrison started to make an appropriate reply, then thought better of it. He was in no ordinary dilemma, and was beginning to know it. It was more a being caught between two opposing sets of antlers bristling with scores of prickly points. The death, as far as that went, of the obscure Leona McWhisney meant nothing to a seasoned doctor. People were dying at Sanitar all the time. But they were dying in approved ways that could be reported on approved forms. Her departure from the normal played hob with the whole Autarchian set-up. Garrison groaned aloud, for he was, until that moment, a thoroughly indoctrinated, obedient, unthinking cog in the vast bureaucracy that was Autarchia. Not once in the thirty years of his life until then had the Code failed him. He had never doubted for an instant that that wonderful document was the omniscient, infallible, unquestionable guide to human behavior. It was unthinkable that he could doubt it now. And yet—

Yet Leona McWhisney was dead, and it was his duty to sign the death papers. By doing it he would certify that her case had been handled in accordance with the Code. There lay the rub. It had been, he was sure, for he knew the superb organization of Sanitar and especially the wards under his control, and it could not have been otherwise. There was no one who would have dreamed of departing from the sacred instructions by an iota. The problem lay, therefore, on his own desk—how to close the case and still keep out of the Monitorial Courts.

The dead woman's disease, as was every other, was curable, and must be recorded on the green. So decreed the Code. But she had died inexplicably despite the Code, and having died, she must be given a death certificate. But there were only three forms of those, for there were only three possible ways for an Autarchian to die. The most common—reportable on the gray form—was by euthanasia after recommendation of a board of gerocomists, and approved by the Bureau of Population Control. Elderly citizens beyond further salvage, or those in excess of the Master Plan were disposed of in this fashion. Then there was the yellow form that was employed when violent accidents occurred. Even the all-wise framers of the Code had not known how to recapitate or re-embowel a citizen thus torn apart. Last of all there was provided the scarlet form for the use of the executioner at Penal House after the monitors had finished dealing with dissenters. That one was on the road to obsolescence, for in recent generations there had been few who refused to abide by the Code, or scoffed at it. The trait of rebelliousness had been pretty well bred out of the race.

Still there must have been some taint of it left, for even Garrison could not bring himself to accept meekly his predicament. *If* people could die of neomalitis, he thought, the Code should have foreseen it and provided for its proper reporting. Apparently they could, and apparently it had not. There was something smelly somewhere.

"When you make up your mind about that," broke in Arna, sweetly, "here are a couple of other questions they want rulings on. The treater on Ward 44-B says that he has twelve patients with neomal that should have been up and out today. The prognosis says so. He wants to know if he keeps on shooting sulfazeoproponyl. He has given all the therapeuticon prescribed."

"No, of course not. Better run 'em through the Diagnostat again and take a fresh start."

He watched unhappily as she made a note of it. It was an unsatisfactory answer and he knew it. There was no more authority for rediagnosing a case than for prolonging treatments after it was supposed to be cured. But it seemed to him that as long as they continued to be sick something should be done.

"And the admission desk wants to know," she went on, "what about quotas? According to vital statistics Sanitar is supposed to get only three hundred cases of neomal a quarter. We've admitted that many in the last ten days. Shall they keep on taking 'em in, or turn 'em away?"

"Oh, we can't turn 'em away," said Garrison weakly. He was right, too. The Code specifically forbade it. But the Code had also set the admission rate for Sanitar, based on the known incidence of various diseases, and it could not be much exceeded for the excellent reason that the hospital's capacity and personnel were fixed by the Master Plan.

"Yes, sir," said the exasperating scribe, and jotted down his answer.

He glanced worriedly at the McWhisney papers on his desk. He could not sign them as they were. He had to make sure.

"I'm going to make an inspection," he announced, and stalked out of the room.

Medical Inspector Garrison was what the Autarchian Code had made him. It was no fault of his that he had been born into a perfect, well-ordered world where every detail was planned and there was no room for independent thought or initiative. He was the natural result of his training. His very first memories had to do with the Code, and from then on he had never encountered anything else. At the age of five the Psychometrists had come and taken him from his creche and tested him with glittering instruments that gave off dazzling multicolored lights. That was when his first psychogram was made and his Cerebral Index established. That was what set him on the road to doctorhood, and made him an interne in a Sanitar at the age of fifteen. By that time he had mastered the Junior Social Code and most of the Medical, and along with it he learned those portions of the Penal Code that applied, plus such other fragments as would be of use. No man alive, with the possible exception of the Autarch himself, could know the whole of the Grand Code, for it covered the entire field of human knowledge. Garrison only knew that whatever there was to be done, the manner of doing it was to be found in some partof the Code. And he also knew that there was no *other* way of doing it. That is, unless he wanted to invite the attentions of the monitors. And it was common knowledge that no one who went to Penal House was ever seen again. The Autarchs did not encourage nonconformity.

It was with this background and the puzzling conflicts of the morning uppermost in his mind that he strode along Sanitar's endless corridors. Hitherto the Code had never failed him. Now he was lost in a maze of contradictory instructions, not one of which he dared question or refuse to abide by. Heretical ideas kept flitting through his troubled brain. Long dormant traits began to stir and come to life within him. Curiosity was one. Somehow it had survived in his heritage of genes. He wanted to know—wanted desperately to know—*why* Leona McWhisney had died, when the book said she couldn't? What was happening in neomalitis? Why was it fast becoming more prevalent? What was making it more virulent? Why didn't the sulfa drug still cure it as it had always done before?

He arrived at the admission desk and looked about him. Everything was exactly as it should be. There the applicants were being logged and turned over to the attendants to be stripped and scrubbed prior to their full examination. Their dossiers were being sent for.

He picked up one at random and examined it. It was a magnificent document, many inches thick. In it was the record of its owner's medical history from birth, complete with the X rays and body chemistry findings taken at every successive annual examination. There were curves of growth and change, and accounts of incidental illnesses. Everything the most exacting doctor could want was there.

Garrison laid it aside and went on. He passed by the various examining rooms and laboratories with little more than a glance in. All were carrying out their functions perfectly. In one place blood and spinal fluid were being analyzed; in another, men sat in rows having their electrocardiograms recorded. A group of psychomeds were probing neural currents to find out a patient's attitude toward his own condition, and elsewhere the newcomers lay on cots having their current basal metabolism established. In the biological lab observers were scrutinizing bacteria cultures and dissecting tissue. Everywhere there were checkers, going over the other fellow's work.

The young inspector knew there could be no slip-up in the collection of basic data. A quick turn through a couple of wards revealed things going well there also, so far as the medication was concerned. He even consulted with the chief pharmaceutical inspector to make sure the drugs used were up to standard. Perfection reigned in exact accordance with the Code. The only jarring note was that the wards were becoming crowded. There were ever more sick, and the sick ones were not recovering as they should. In 45-B Garrison was stunned to learn that two more neomals had just died, and that several others were about to. It took the McWhisney affair out of the freak class. It denoted a trend. It also ended the hope of overlooking that first case.

There could be but one other factor. The data were correct, and the treatment given as prescribed. The only other room for error was in the diagnosis, so Garrison went to the elevator bank in the great central tower. No one had ever questioned a Diagnostat before, but he meant to now. He punched the button for the express car to the sub-basement.

The only word to apply to the cavern where the ponderous machines purred and ticked was—vast. The great monsters stood in long rows—the Sorensons down one side of the room, and the Klingmasters the other. Those massive calculators were the only examples in all

Autarchia where two distinct models of machines were doing the work of one. In every other case the framers of the Code had selected the best type and discarded all the others. But the Sorenson and Klingmaster Diagnostats arrived at their findings through radically different channels. Since they were equally efficient both were kept, to be used in opposing pairs, one to check the other.

Garrison offered the foreman of the room the dossier of Leona McWhisney.

"Hm-m-m," mused the foreman, glancing at the record. "This has already been through—done on Sorenson 39, cross-checked by Kling 55. Neomalitis, Type III, sub-type C. What's wrong?"

"She's dead," said Garrison.

The foreman shrugged.

"All we do here is diagnose 'em. If they kick the bucket, it's somebody else's fault. You'd better check up on your treaters, or on the dope they use."

"I have. It must be the diagnosis. It can't be anything else."

"Oh, can't it?" countered the Diagnostat foreman. "Did you know they lost ten pneumonia cases over in Bronchial wing last week? Did you hear about the guy up in Psychopathic? A mild neurosis was all we had on the fellow here. Well, he ran amok last night—cut the throats of four fellow patients and then jumped out the window. There is something screwy going on, all right, but it's not down here."

"I want a recheck on this," insisted Garrison.

"But she's *dead,*" objected the foreman. Then he saw the glitter in Garrison's eye. "O.K.," he mumbled, and reached for the book.

Garrison looked on in silence while the monster did its work. The data was fed in by various means through various orifices. Queerly punched cards bore part of the information—such items as could be expressed by figures, as weight, pulse, blood pressure, respiration, and so on. The curves of the cardio and encephalograms were grabbed by tiny steel fingers and drawn into the maw of the machine. It clucked loudly as the X-ray plates were slid into a slot. The amplitude and frequency of the undulant fever readings were given it. When all was in the foreman closed one switch and opened another.

"This is a different Sorenson, and hooked up with a different Kling," he said. "Both were overhauled last night, but I'll bet you get the same answer as you got before."

"That's what I want to know," said the inspector.

The machine purred and groaned. Then it set up a clicking and stopped momentarily. Up to that point it had ignored the symptoms, Garrison knew, and was engaged in breaking down and analyzing the basic factors. Now it reintegrated them and was ready for its first pronouncement. A window lit up with glowing letters:

Constitution fair. Physical Resistance Factor: 88.803; Psychic Factor: 61.005. Composite Factor: 72.666.

The light died, and a confirmatory card dropped out. The purring was resumed. Garrison considered the figures. They were about right. The woman had been of excellent general physique, though a trifle depressed in spirits. She should have thrown off any disease with reasonable ease.

Now a red light was burning, indicating the Diagnostat was taking into account the developments due to infection. After a bit a gong sounded, and the machine growled to a full stop. Another card dropped out:

Neomalitis, Type III, sub-type C.

Garrison looked at it, then walked across the hall to the Klingmaster. It was slower to reach its conclusion, but when it did it was identical.

"All right," said the foreman, "that's that. Now let's do the rest."

He poked one of the cards into a smaller machine—a therapeuticon, with prognosticon attachment. It took the contraption less than a minute to cough out the answer:

Indication: 6 g. sulfazeopronyl every four hours for eight days. Tepid baths daily; abundant rest.

Prognosis: Discharge in nine days, ten hours.

Garrison looked crestfallen. He thought he had an out. Now he was where he started. He shook his head dismally.

"She's dead," he said, "and it's only a week."

"An autopsy ought to settle it for you," suggested the foreman.

"It has," said the miserable inspector. "It said neomalitis."

And he walked away, leaving an indignant Diagnostat man glaring after him.

Garrison signed the pale-green paper reluctantly. There seemed to be nothing else to do. Then he glanced at the chronodial and saw that it was nearly seventeen, time for the day-watch to go off duty. At that moment there was a shrill warning buzz and the omnivox lit up. A fanfare of trumpets warned that something big and unusual was about to come through. He got to his feet and stood at attention. A uniformed figure appeared on the screen.

"By order of his supremacy, the Autarch," he proclaimed in a deep, sonorous voice. "Effective immediately, those provisions of the Social and Penal Code requiring attendance during Renovation Hour at Social Halls is suspended for officials of C.I. one-thirty or better. Such officers may attend or not, as they choose—"

Garrison blinked. He had never heard the word "choose" before and had but the faintest idea of what it might mean. More obscure ones were to follow.

"If they so elect, they may stay within their own quarters or visit other officers of siniliar rank in theirs. Restrictions as to topics of conversation are lifted during this period. Officers will not be required to discuss assigned cultural subjects, but may talk freely on any topic they prefer. Monitors will make note of this alteration in the Codes.

"The order has been published. Carry on."

The light failed, and with it the figure on the screen. Garrison continued to stand for about a minute, entirely at sea as to what the communication he had just heard meant. Such words as "elect," "choose," and "prefer" had long since become obsolete if not actually forbidden. The concept of choice was wholly absent under the autocracy. It never occurred to one that there could be such a thing—it was inconsistent with orderly life. One simply obeyed the Code, which always said "you shall." To think of anything different was rank heresy and treason, and subject to the severest penalties. Garrison puzzled over the order a moment and gave it up. No doubt there would be further clarification later. Perhaps the Propag lecturer of the evening would have a word to say about it. The order would be carried out of course, but to Garrison's well-disciplined mind it had the bad fault of ambiguity.

The ringing of the corridor gongs snapped his attention away from it. It was time to assemble for supper. He closed his desk, slipped on his tunic, and stepped out into the hall. There he faced to the left as the others were doing, and waited for the whistles of the monitors.

The signal was sounded, and the tramp of feet began. Garrison stepped along as he always had done, but with the difference that on this afternoon there was turmoil in his mind. Having to sign that altered document had done something to him. It hurt, and hurt deep. It is difficult for anyone not imbued with bureaucratic tradition to comprehend the poignancy of his anguish. He had been forced by the rules themselves to break a rule. For the first time in his existence he was compelled to question the all-wisdom of the Code. The Code had declared neomal curable; he had seen the exception. And while he was still quivering with mortification at that discovery, the pronouncement of the Autarch had come. He did not know what it meant precisely, but it signified one more thing clearly. The Autarch had seen fit to *modify* a Code. The implication was inescapable. The Codes were not infallible. If one provision could be altered, so could all the rest. It was food for anxious thought.

The marching men came to a downward ramp and took it. On the level below Garrison had to mark time while the officers of that floor cleared the ramp below. He took the occasion to look them over critically—something he had never thought of doing before. Like himself not a few of them but also had

had inexplicable deaths in their jurisdictions, and every one of them had heard the message just received from the Autarch. But not one of them showed the flush of suppressed excitement that he was awkwardly aware warmed his own cheeks. If there was any who shared his newborn doubts, none exhibited it.

They marched like so many automatons. Nowhere was there a sign of perplexity or frustration. Instead, he now observed that all were sunk in the same dull apathy that he had noticed in the incoming patients. It was not the apathy of weariness or despair, but a sodden, negative something—sheer indifference. They did not care. There was no motive to care. Their personalities were not involved, if a citizen of Autarchia could be said to have such a thing as a personality. They were required to put in so much time, and to obey certain inflexible rules. So long as they did that they had no responsibility as to the outcome. Now they had done their stint and were on their way to replenish the energies they had expended by the ingestion of necessary food. The evening to follow would be but an extension of the day—planned, orderly, meaningless.

At times the worm turns in a curious way. In that split second the spirit of some long dead ancestor stirred within Garrison and woke him up. The breath taking realization came to him that he was an *individual—he,* Philip Garrison, Medical Inspector of the B wards of Sanitar. He was different somehow from those others. They were clods, puppets. What did it matter what their Cerebral Indexes were, so long as they could read and punch the proper buttons? Anyone above the moronic level could do the same. No thought or judgment was demanded to conform to the Code. Small wonder they swung along like men stupefied.

Garrison could not avoid a slight shudder. The trend of his thoughts were highly treasonable. Then he reminded himself that the monitors possessed only hidden mikes and scanners; they were not telepathic. They could not read the heretical notions striving to make themselves dominant in his brain. He calmed himself, and tried to change his line of thought, for he knew that madness lay that way. He endeavored to recall what a Propag had said at a recent lecture about the "dangers inherent in independent thought" and the hideous predictions of how disruptive such ungoverned activity could be.

The arrival at the dining hall put a temporary end to that. He handed his ration card to the Dietitian of the Watch. She glanced at it, scribbled the prescription, and dropped it into the messenger tube. That was all that was required. He marched on with the living robots about him. Shortly he would get food that would no doubt be good for him—sustaining, and containing what he needed, neither more nor less. It would have the calories required, and the vitamins, and the minerals. It might be tasteless, it might be unpalatable, it was almost sure to be mostly synthetic. But it was what his metabolometer called for, and with that there was no arguing.

Garrison ate in sullen silence. So did the others, but with a difference. Theirs was the stolid silence of oxen at a trough. Even the director and the ranking members of his staff on their raised dais ate in the same manner. It was a thing they had to do—it was part of the routine, joyless but necessary. Now Garrison was beginning to understand why people were falling ill with such ease, and being ill, failed to rally. Life was empty. They did not care, nor did their physicians care. It was that spirit of don't-give-a-care that was pushing Autarchia to the brink of ruin.

"I'm going to do something about

this," muttered Garrison to himself, "and I'll start by finding out why neomal kills."

He went out with the crowd when the "dismiss" signal was given. He took the elevator to the tower where the gyrocar was waiting. Then he sat in the seat his position rated—one by a window, and hung on as the car teetered drunkenly as it cleared the slip. After that it straightened up and went whizzing along its elevated monorail, careening around curves on its nightly trip to Dorm.

The sun was on the point of setting, but everywhere there was full light. It was rolling country, covered with fields, and the horizon was broken only by the occasional bulk of a plant where alcohol or plastics were made from the products of the soil. The intervening fields were planted in corn and tomatoes, bulk crops that could be grown more profitably outdoors than in the hydropones. An army of low C.I. laborers was still at work, spraying the lush weeds under the watchful supervision of the agronomists who sat perched on lofty chairs set up among the tasseled rows.

Now that Garrison's eyes were opened, he saw what he had looked at daily but had never comprehended before. It was that the laborers' work was futile. The cornfields and the acres of tomatoes were like his wards in Sanitar. Uncontrollable and malignant weeds and blights had moved in and were taking them. As the car rushed over a hilltop where the ground rose up almost to it, he could see the details better. Where once the fruit hung bright and red and round, it was now sparce, discolored and misshapen. Plump ears of corn were replaced by scrawny spindles riddled with wormholes. Garrison could glimpse them now and then despite the weeds which in many places towered even above the tall corn.

The sight added to his glumness. It had not always been that way. Only a few years before the fields had been clean and sparkling—good reddish soil topped with orderly rows of the desired crop plants and nothing else. Insecticide sprays and selected chemical soil treatment used to work. Lately they did not seem to. Why? They had successfully done so for two hundred years. What was bringing about the change? Was the Agricultural Code inadequate, too?

The car swerved and swept across the highway. A pile of grim gray buildings flashed by. That was one of the many structures known as Penal Houses. To Garrison's new awareness it took on a change of significance. It was another symptom of what was wrong with Autarchia. Designed to hold ten thousand unhappy rebels awaiting execution, today it stood empty. Seven generations of systematic extermination of dissenters had done its work. The breed was now extinct. No one thought of, let alone dared, dissent these days. The very concept of nonconformity was extinct. Garrison knew of it only because of the warnings of the Propags and the presence of the watchful monitors. Yet the prisons still stood. They were useless anachronisms now, complete with large garrisons of monitors waiting boredly for more grist for their mills. But they could not be abolished because they, too, were part of the Master Plan. What *was* must always be.

Garrison turned away from the prison in disgust. It would be better, he thought, if the idle monitors were put to work in the fields tearing out the weeds by hand. Then they would be at something productive.

The car swirled on. Suddenly, but briefly, the panorama underwent a change. For about a mile there stretched a field that was uncontaminated like the rest. It looked as all of them used to look. Then the car left it and was over another planted with the same crop, but as weed-choked as the earlier ones. The contrast of the one well-kept field with the others was startling.

Garrison craned his neck to look back. As he did he became aware that the officer sitting behind him was watching the act intently. He was an old man and wore the distinguishing marks of a high ranking psychomed. It was that that made Garrison uneasy, for many of the senior psychomeds seemed to possess the uncanny knack of reading people's minds. In the state of agitation he was in he preferred not to be under one's scrutiny.

"Rather different, eh?" queried the older man, with a quizzical smile. "Why, I wonder?"

"Different soil, probably," ventured Garrison, feeling some answer was expected.

"Hardly," remarked the psychiatrist. "They took such differences into account when they drew up the Master Plan. All these fields are assigned to the same tillage."

"I'm only a medic," hedged Garrison, "I wouldn't know."

"For the very reason that we are medics," pursued the other, "it might pay us to know. Below us are fields that have been successfully farmed for centuries. Now the pests refuse to be kept at bay. They are conquering except in that one field that seems to interest you. It would indicate, I think, that one Agronomist knows something the others do not. That fact is worthy of our consideration."

"Why?" asked Garrison stupidly. He knew it was stupid, but the conversation was taking a perilous turn. This psychomed was probing dangerously near to his heretical inner thoughts. Garrison wanted to mask them.

"The analogy between vegetable blight and human disease ought to be apparent to anyone," shrugged the elder doctor. "We study both and find remedies. Then, in the course of time, one or the other or both get out of control. Haven't you found it so?"

"A woman died in one of my wards last night," hesitated Garrison, "if that is what you mean. She should not have, so far as I can see. But we did our duty under the Code—"

The psychomed glanced cautiously about. The other passengers dozed sluggishly in their seats. The noise of the car precluded eavesdropping.

"Our duty is to save lives, my friend," he said in a low tone. "In that the truly excellent Code is our best guide. But there is coming a time, and soon, when it must be changed—"

"Yes, yes, perhaps," said Garrison, flurried, half frozen with alarm. Those were fearful words, and a lifetime of listening to Propags had set his reflexes. It was not a light matter to change their patterns. "If such a time should come, no doubt the Autarch will give consideration to it."

"The Autarch is neither doctor nor agronomist nor any one of the hundreds of other kinds of specialists it takes to operate a world like ours. He may sense impending peril, but how will he know how—"

"Sir," said Garrison stiffly, scared through and through, "your words border on treason. I refuse to listen. Have a care, or you will find yourself in trouble:"

The old man gave a contemptuous snort.

"Trouble? Listen, boy. I am inspector general for all the Sanitars in this hemisphere. You know of several unaccountable deaths; I know of thousands. You have seen a handful of stricken fields; I have seen abandoned wastes stretching hundreds of miles. It adds up to one dire result—pestilence and famine. Not yet, but soon. If you think the monitors are to be feared, think on that pair of scourges."

Garrison kept silent. He was afraid still in spite of himself, but he wanted to hear more.

"As for myself, nothing matters," continued the psychomed. "I chose to speak to you because you turned back for a second look at the one well managed field. It showed me that regimentation had not made a clod of you altogether. There are not many of us like that, so I broke the ice. Tomorrow I appear before a Disposal Board. The gerocomists say my heart is beyond aiding and my course is run." He grinned. "And having a bad heart I am immune from torture. Euthanasia or standard execution—it's all one to me."

"I'm sorry, sir," said Garrison.

The gyrocar was slowing for the approach to Dorm.

"You needn't be," growled the old doctor, taking in the other occupants of the car in an all-inclusive sweep of the arm. "Be sorry for *those* dumb inert creatures. And by the way, if you care to pursue the subject further, the name of the agronomist in charge of the field you liked is Clevering."

The car reeled to a stop. Garrison scrambled to his feet and crossed the spidery bridge that gave access to the high tower of Dorm.

Beneath were the huge public rooms, the baths and gymnasiums and the libraries of the Code. Down there were kept the individuals' records, and also where the vast social hall was. The rooms and dormitories were in the starlike wings.

Garrison took the elevator to his floor, and walked along the corridor of his section. The door of the cubicle he called home was open, as all doors had to be when the room occupant was absent. He went in and lay down on the narrow bunk for the prescribed period of rest. From it he surveyed his habitation with some curiosity, never having thought to do so before.

There were the plain plastic walls, dimly luminous, and the Spartan cot he lay on. There was a chair on which he hung his clothes at night. During the night an attendant would come and replace them with others. He had no need for any but the authorized costume of the day, and it was always provided. There was a small washbowl with a shelf and mirror above it, beside which was posted his individual hygiene instructions—the hours of rising and going to bed, the hour and nature of the bath he was to take, and such details. On a small table lay a copy of the Social Code. That completed the furnishings.

Ordinary Garrison spent the rest period relaxed and with a blank mind. Today he could not. He kept turning over in his mind the problems that seemed to be growing more complex hourly. There was the death of Leona McWhisney, the enigmatic edict of the Autarch, the provocative remarks of the psychiatric inspector, and the mystery of the one uncontaminated farm. Now he had to deside also what he was going to do about the Social Hour. The daily event was always boring, as was most of the well-ordered life he led, but it was a way to while away the time until the hour set for sleeping. He wondered how one went about visiting another in his room, and if he did visit, what they would talk about. And that caused him to open an eye and wonder where was the scanner-mike that kept watch on his room, and whether it was alive all the time, or only now and then.

Habit is strong. He was already sitting up on the edge of the bunk when the stand-by buzzers sounded. That meant five minutes until Social Hour began. He was already tired of his cell and wanting to move. He heard doors outside being opened and the shuffle of feet. The others were on their way. He hesitated, then got up and went out, too. There was not a closed door in the hall. The man opposite him had just come out—a master electrician in charge of the X-ray machines.

"You are going as usual?" asked Garrison.

"Where else is there to go?" answered the fellow.

"We could stay here and talk," suggested Garrison.

"About what?" he asked curtly, and turned down the hall.

The harried glance he gave the walls and ceilings as he did was the clue to his behavior. Garrison instantly read it aright. The Autarch's edict of the afternoon stated that certain regulations were "suspended." There was nothing in the way of assurance that the free conversations allowed would not be listened to and recorded by the monitors. Garrison frowned. Could the Autarch's seeming generosity be a ruse to entrap the unwary? Small wonder the fellow had ducked. For his part Garrison realized he had just had a narrow escape. He meant fully to discuss the McWhisney death and other things with anyone who would listen.

Garrison went on to the Social Hall. The evening proved to be, if possible, duller than usual. Garrison found the other officials ranged in chairs before the lecture platform waiting stolidly for the Propag to begin. None had so much as delayed his coming. Garrison sat down at his customary place. The Propag was coming on the stage.

"It has come to my ears," he began in the sing-song voice affected by the members of his profession, "that a few of you are troubled. In hours of weakness it is human to falter, and there may be some so debased as even to doubt our wonderful Code in the dark moments. That is evil. The Code is all-wise. Believe in it, follow it, and trouble not. All will be well. Let us, my friends, go back and remember our first lessons.

"In the beginning there was chaos. All the world was divided into many nations, speaking different languages, having different customs, and struggling one with another—"

Garrison did not have to listen. The famous "Basic Lecture" had been dinned into his ears at yearly intervals all his life. Once it meant something, now it was an empty piece of ritual. Men sat through it unhearing, for they knew its words by heart.

It told of the Bloody Century—the Twentieth—and of its devastating wars. Those were the bitter conflicts between Imperialists and Republicans, Totalitarianism and Democracy, and the varicolored races. Then would come the story of the infant leagues and unions of nations, and the bickerings among them for top power. Afterwards there were fierce revolts in certain quarters. The world before The Beginning was a world of strife and murder and destruction. It was a horrid world.

"Yes, horrid!" the Propag would scream at that point. "An insane world. A world where there were many opinions about the simplest matters. Men differed, and because they differed they fought. It was under the sage Harlking the Great—the Autarch of the Fourth Coalition—that the Grand Code came into being. He perceived clearly that the world, though not perfect, was good enough if men were only content. So he convoked an assembly of the thousand wisest men of the age. These were the men we now call the framers, for their task was to sift the world's store of wisdom and select the best for inclusion in the Code. It took forty years for them to complete their colossal work, but when it was done the Autarch pronounced it good. That was Gemmerer the Wise, for Harlking did not live to see his glorious idea come to fruition.

"Gemmerer promulgated the Grand Code, and in doing so forbade that it ever be altered. He foresaw that there would still be impatient men, or dreamers who might try vainly to better things. Man in primitive societies is hopelessly inventive. He is never content with things as are. This was an admirable trait in the formative days of civilization, but in a highly integrated world community is harbors the germ of warfare. The introduction of a new thing is always a challenge to the old, and the partisans of the old invariably fight back. There must be no more war. Therefore there must be no new thing. Stand men, and repeat the creed of our fathers!"

Sheeplike the audience stood. The Propag led off, and the mumbled chorus of responses followed.

"The Code given us is good!"

"It must not be altered."

"It is the quintessence of the wisdom of the race!"

"It must not be questioned."

"It must be obeyed forevermore."

"Amen."

The rumbling echoes of the whispered responses died, and the men dropped back into their seats. The Propag treated them with his professional glare for one solemn moment. Then he partially dropped the cloak of solemnity.

"Is there anyone present," he asked, still stern, "who . . . ah, *prefers* to talk about a topic other than the one we have been studying?"

Several men shifted uneasily in their seats, but no one answered.

"Very well," said the Propag, "we will break up into the usual groups. Group directors please take charge."

There was a rustling as the men found their way to the places where they were to be treated to cultural enlightenment. Garrison joined his proper group dejectedly. He cared less than ever for the plump, curly-haired young man who was his renovation director. That worthy looked his small flock over and saw that they were all present.

"Last night," he chirruped with a false heartiness that made Garrison want to smack him, "we were discussing the complementary effect of strong colors when placed in juxtaposition. Now, if we take a vivid orange, say, and put it alongside an intense green—"

Garrison heard it out, bored stiff. Real problems were stewing inside his head, and the froth he was compelled to listen to angered him. Otherwise it was simply dreary. But eventually it came to an end, and the Social Hour broke up. Garrison caught up with a departing agronomist, and asked him where he could find Clevering.

"Clevering? I think he's sick. He collapsed in the field today. As I was coming in I saw a Sanitar ambulance going in the gate.

"Thanks," said Garrison, and tramped down to his cubicle, and to bed.

Nine more neomals died in Ward 44-B that night, and in the morning there were no discharges. But waiting at the admission doors were hundreds of new cases—too many to be accommodated under the quota. Garrison noted with a wry sort of satisfaction that the admitting doctors were also struggling with an insoluble problem. There were others besides, as he found out when he reached his office. Treater Henderson was awaiting him there with a sheaf of new diagnoses.

"What am I supposed to do with these?" he asked, plaintively, shoving them into Garrison's hands. Garrison took the topmost card and stared at it.

Diagnosis: Neomalitis, Type $≠!.. etaoinshrdlu..sputsputsput.
Treatment: Sulfazeopropropropropprpopopop....nyl!
Prognosis: ?????????

He scowled and grabbed up an intercommunicator. In a moment he had the foreman of the Diagnostat room on the wire.

"Have your machines gone crazy?" he snapped. "They stutter. They give us gibberish."

"Can't help it," came back the answering voice. "We tried machine after machine. They all do it. And our tests conclusively show—"

Garrison flipped off the connection. He was up a blind alley there and knew it. He turned to the treater.

"Keep on giving 'em the standard sulfa treatment"

After the treater left Garrison sat down weakly and wiped the sweat from his brow. So far he was within the Code, for sulfa drugs were indicated for all cases of neomal, regardless of type. But intuition told him that hereafter it would do no good. The stark truth was that the neomal bug had bred itself into a new type—a strain far hardier than the old, and more malignant. What he had to contend with was a bacillus that was practically immune to sulfazeopropionyl. It was, therefore, causing an utterly new disease, one not contemplated by the august framers. And, unless something was done quickly, a decimating plague would shortly be sweeping the world.

But what? The Code prescribed only the sulfa drug in such and such quantities, and the penalties incurred for administering any other were cruel. Garrison stared miserably at the stack of diagnosis slips. For once he felt a sense of personal responsibility to those sufferers down in the wards. He felt like a murderer. Then his eye lit on a name atop a card. The name was, "Henry Clevering, Agronomist 1st Class."

He lost no time in getting down to the ward.

The wards of Sanitar were not wards in the old sense, but groupings of rooms, and Garrison found his man in the fourth one on the left. The moment he saw him he knew his hours were numbered, for the chart showed the oscillations of the fever hitting ever new highs with a shortening of the period between. Already the ever vigilant monitors had set up a portable mike beside the bed to record his ravings when a little later he would be in delirium. In earlier days such deathbed revelations had often given them valuable leads to subversive dissenters still living.

Garrison saw the fever eyes of the sick man following him about the room, but he went about what he had to do. He closed the door softly, and then stuck a wisp of cotton into the mike so as to damp its diaphragm for the time being. He sat down beside the patient and placed a cool hand on his forehead.

"The weeds have got me at last, I guess," said Clevering, smiling feebly, "weeds or blight. They're getting bad, you know."

"Yes, I know," said Garrison, "and that is why it is bad for Autarchia to lose a man who knows how to fight them."

"Autarchia?" whispered the other, "a lot Autarchia cares. If they knew what I know, they would have crucified me long ago. But you are not speaking for Autarchia, or you would not have shut off that spy's ear."

"By Autarchia I meant the human race," replied Garrison, soothingly. "I saw your farm last night. I really saw it, for I've been blind up to now. I want you to tell me how you kept your field clean. We have needs of a sort here too, you know."

Clevering smiled wanly.

"You want to know what I did, eh? Well, I forgot the Code when I saw it wasn't working any more. I tried this and that until I found something that did work. Organic things don't stay put. They grow and change and evolve. What stood off the blights when the Code was drawn isn't worth anything these days. I found that out years ago when it first got bad. I falsified my records so the inspectors wouldn't know. That is how I kept out of Penal House. Maybe I should have spoken out before, but who was there to hear? I do love a clean cornfield, though, and that's why I kept plugging. The books helped, too."

A spasm of shivering shook him as a fresh chill came on. Garrison gave a worried look at the chart. He had not arrived too soon. The next fever peak would probably be the last. Clevering was a dying man.

"What books?" asked Garrison sharply. "There are no books that I know of except the Code."

"The . . . the ones in the Autarch's secret library," managed

Clevering through chattering teeth. "A few were stolen years ago by a dissenter who was a palace guard until the monitors found him out. They have been handed down through several generations to trusted fellow believers. I am the last one. There are no others that I know of."

"I am one," said Garrison quietly. He was astonished at his own coolness when he said it, for twenty-four hours earlier he would have allowed wild horses to pull him apart rather than utter the blasphemous words. Now all that was changed.

"I am seeing people die who should not be dying," he explained. "I don't like it. The Code is—" here he almost choked on the words, such is strength of inhibiting doctrine, "the Code is—well, the Code is all wrong! It's got to be changed. It's got to be *repealed!*"

"I believe you," said Clevering, and pulled Garrison toward him so he could whisper, "the books are under a false flooring in a shed—"

Garrison listened attentively to the instructions, but before the patient quite finished, the fever got the better of him and he rambled off into incoherent nonsense. Garrison stayed on, for it was not all nonsense. There were lucid stretches in which Clevering lived his experiments again—the trying of this or another spray on the blights, and the application of various chemicals to learn which helped the corn and discouraged the weeds. At length the end came, and there was no more to do. Neomal had claimed another victim, this one appallingly swiftly. Garrison removed the plug of cotton and softly left the room.

Garrison's life for the next five weeks was a frenzied jumble of concealed activity. Taking infinite care to wear the mask of common apathy, and covering his movements with studied casualness, he steadfastly pursued two aims. One was the reading of the forbidden books, which he dug up during his first available free time. Thereafter he read them in his room, hiding them meanwhile in his mattress. The books were a strangely variegated lot. Some were on scientific subjects, others social or philosophic. There was history, too, and something about religion. The book he came to love most of all was a very slim one—a little volume on "Liberty" by a John Stuart Mill. His limited vocabulary troubled him much at first, but he shrewdly arrived at the meanings of such words as "choice" and "freedom" by considering the context. He discovered to his delight that there were shades between good and bad. There were the words "better" and "best" as well as the bare, unqualified "good."

While the books opened up vistas unimagined to his thinking, it was at Sanitar that he performed his most imperative work. He wanted to find out why nomalitis had suddenly turned killer, and how to foil it. On the pretense of checking the biologists, he pored over blood and lymph specimens of the ever arriving patients. He built up culture colonies, and then tried to destroy them with modifications of the sulfa drug. The results were negative, so he tried other compounds. Then he cultured viruses, and pitted one strain against another. And as the average Psychic Resistance Index kept dropping lower he pondered that feature. Apparently the Diagnostats were not calibrated for patients so consistently depressed and without desire to live, for shortly the uncanny machines balked at giving any prognosis whatever. All that would come out was a meaningless jumble of characters.

At last the day came when he found a drug that killed the new strain of neomal bacilli in the laboratory. He was careful to restrain any expression of joy, though his impulse was to leap into the air and yell "Eureka!" Instead, he cautiously loaded a number of hyperdermic needles and wandered into a ward.

He sent the attendants away on various errands, and set about the risky job he was compelled to do. He injected all the patients in the rooms on the left-hand side of the corridor. Then he went as soon as possible to his office and awaited results.

They were not long in coming. Within the hour an agitated treater rushed in.

"All hell has broken loose in 44-B," he reported. "It *can't* be neomalitis those patients have. "They're in convulsions."

"I'll be right down," said Garrison. His bones had turned to water, but he had to see the thing through. He knew, from his belated reading, that one was supposed to experiment on guinea pigs and monkeys before injecting strong and untried medicines into human beings. But there were no longer any such animals. They had been decreed useless and were long extinct. Yet the patients were doomed anyhow—he felt justified in taking the chance. But he had not foreseen convulsions.

By the time he reached the ward the worst of the spasms had subsided. Some of his inoculated patients had succumbed in their agony. The remainder lay spent and gasping, with expressions of utmost horror on their faces. Garrison surveyed them stonily, but his heart was cold with anxiety.

"Very odd," he remarked, making notes. "I shall report it, of course."

He was too upset to do anything else that day, but that night he thought long and hard about it. The following morning he learned to his immense relief that only a few more of his illegally injected patients had died, whereas the half ward under Code treatment had lost its normal number—about eighty percent. During the tense day that followed, the survivors among his experimental subjects began to rally. By nightfall several had lost all symptoms. In a day or so,

THE BEST OF THE WEST

—in one big 160 page Annual!

An anthology of the finest western stories Street & Smith has published!

The authors in this big bargain book are the top-hand Western writers whose work you know from books, screen and radio. Among the famous names are:

WALT COBURN · BENNETT FOSTER · L. L. FOREMAN
C. K. SHAW · S. OMAR BARKER · HARRY F. OLMSTED
HARRY SINCLAIR DRAGO

Illustrations throughout and a striking four-color cover!

For you who are thrilled by the adventures of the men and women who carved a great empire from the danger-packed frontiers of our country—this is *your* Annual! And it's only 25c (30c in Canada)! Get your copy now. If your dealer can't supply you, fill out the coupon below.

WESTERN STORY ANNUAL

25c A COPY 30c IN CANADA AT ALL NEWSSTANDS

WESTERN STORY ANNUAL, 79 Seventh Avenue, New York, N. Y.

Enclosed is 25c (30c in Canada). Kindly send me the new WESTERN STORY ANNUAL.

Name____________________ Address____________________

City____________________ State ____________________

barring relapses, they could be discharged.

"I'm on the track," Garrison exulted. "Perhaps I used too strong a solution."

He attacked the problem with renewed fury. Day after day he tried dilutions and admixtures of other chemicals. There were unhappy results at times, but on the whole he was making splendid progress. At last there came a day when there were no deaths among the ones he treated by stealth. A grand glow of achievement warmed him, and when he returned to his office he could not help walking like one who had conquered the Earth. He had tried, fumbled, and then gone over the top. Now he understood the rewards that come to those who achieve by their own wit and handiwork.

But there was another kind of reward awaiting him. At the door of his office two grim monitors met him. They shut off his remonstrances with a blow across the face. Then he was hustled into an elevator and shot to the top of the tower where an angry director was pacing the floor. A smug inspector of pharmaceuticals was standing by with a packet of inventory sheets.

"Explain yourself, sirrah!" snorted the pompous, red-faced man who headed Sanitar. "What do you mean by forging chemical withdrawals? Sulfa drugs—pah! You have not used a gram of sulfazeoproponyl in ten days. Instead you—"

"Instead, I have been saving the lives of my patients," said Garrison quietly. "I gave them the Code stuff and they died, just as they are doing in the other wards. Therefore I knew that—"

"Silence!" roared the director, shutting him off. "Not a word more. Nothing . . . *nothing,* mind you . . . is as hideous as willful violation of the Code. What does it matter whether a thousand or more weaklings die? It is better so than to return to chaos. Monitors, do your duty!"

The monitors did their duty. They did it precisely as the Penal Code said they must, exactly as it had been found necessary in the early days when there were many rebels, and those tough and fearless. They flung chains about his wrists and dragged him to the elevator, kicking and cuffing him at every step. They paraded him through the great lobby on the ground floor for the edification of his brother ratings. And then they hurled him half unconscious into the waiting prison van. After that for awhile Garrison hardly knew what happened to him. There was a prolonged session under a dazzling light, during which venomous voices hurled abrupt questions at him. They injected him with scopa, and they brought psychomends of the Penal branch to try hypnosis on him. They beat him at intervals, and confronted him with the books they had uncovered in his room.

"You are fools, fools, FOOLS, I SAY!" he screamed when he could stand it no more. "Yes, I had an accomplice. His name was Clevering . . . Clevering the agronomist. He's dead now, so it does not matter. He kept the weeds out. He kept the blight out. So you have corn. That was contrary to the Code, but you have it!"

That was when his memory ceased to register. The things they did to him after that did not matter. Or they did not matter until hours later when he found himself crawling miserably on the hard steel floor of a cell. He felt his wounds and the stickiness of them made him faint again. After that he slept for many hours.

How many days he languished, sore and battered and hungry, in the dark he had no notion. He was hauled out one day for questioning by a solemn board of psychomeds. That was to determine his sanity. He answered them defiantly from between swollen lips and with words that had to be mumbled for lack of teeth. They overwhelmed him with scorn, and pronounced him sane. The Penal Code could take its course. After that there was more of darkness. Not one person in Sanitar or from Dorm attempted to communicate with him. He was unclean. He was different. He was a convicted dissenter. His name was already erased from the roster of the living.

It was an eternity after that when the four burly monitors came in the dead of night. He heard the heavy tramp of their feet in the corridor, and the crash as his door was thrown open. Then hand flashlights played on him.

"Up, snake!" snarled one, and yanked him to his feet.

"Don't mark him any more," warned another. "The captain said not. The Autarch is going to work on this one in person, and they say he likes 'em fresh and able to take it."

The other monitors snickered, and something whispered was said that Garrison's ears did not catch. Then he was shoved into the desolate corridor and propelled forward. Next came a jolting, mad ride to the airport, and then comparative quiet as the giant stratoplane soared through the sky. Sometime later there was another ride in a van, with a stop after a bit for challenges and explanations. Then Garrison heard the creak of great bronze gates opening on seldom used hinges, after which he was handed through a door and into a small elevator.

The moment he stepped out he knew he must be in the palace. He had not imagined such grandeur. The floors were heavily carpeted in rich designs, and the walls glowed with an eerie softness. Uniformed flunkies and guards stood everywhere, eying him curiously. Garrison became painfully aware of his own drab appearance, for he wore only a very dirty shirt badly stained with blood, and his body was encrusted with the muck of his cell floor. His beard had grown untouched since the first day of his incarceration. Add his bloodshot eyes and battered features to that and he knew he must present a perfect picture of a desperate criminal.

A silver robed official of the palace intercepted them.

"Oh, he can't go in like that," he said. "He'll have to be washed. This way with him."

Garrison felt better after the repair work was done. He had resigned himself to taunts and tortures and ultimate death, but it felt good to be clean for once. They even trimmed his hair and shaved him, and dressed him fully with dark-blue silken clothes after applying pleasing ointments to his welts.

"You needn't mock," Garrison cried out, as they slipped the smooth cloths onto him. "I am a dissenter and proud of it. Let's get on with it."

"Take it easy," said the treater who had patched him up. "The Autarch would not have sent for you if you had been just an ordinary case."

They gave him a sweet mixture of chocolate and milk and put him in a darkened room to rest awhile, telling him that his audience was not to be until noon. He tried to rest, but could not. Too much was running around inside his head. He knew that he was condemned to die, for the monitors had told him as much. His hope was that before the hour came he could at least get the reason for his rebellion on the record.

An officer of the guard came and escorted him down the carpeted halls. This time there were no harsh words or cuffing, but stiff civility. He took him to a pair of richly paneled doors which two flunkies drew open. Garrison was told to go in, and the doors closed silently behind him. He had entered alone; the officer remained outside.

It was an immense square room, luxuriously appointed, and facing him was a massive desk beside which stood a man he knew must be the Autarch. He was a magnificent specimen of manhood, tall, barrelchested, and commanding. He wore a robe of wine-red satin bound with cloth of gold, but his gray-streaked leonine head was bare. His gaze was steady on Garrison—a coldly appraising gaze from hard blue eyes, and under them an unsmiling mouth of iron. When he spoke it was with a deep and vibrant voice without a trace of emotion in it.

"So you are a rebel," said the Autarch, almost as if he were speaking to himself.

"I am."

Garrison was desperately afraid he was about to tremble, for the man's personality was overpowering, and nothing in his previous career had conditioned him to cope with it.

"Why?"

"I was failing in my job . . . despite the Code," said Garrison slowly, "and I felt I should do something about it. I did, and succeeded, after a fashion. I saved the lives of some of our citizens. That is my crime. If I had it to do over again, I would do the same."

"Ah," said the Autarch, taking a deep breath. "So you defy me?"

"You do not understand, or you would not call it defiance," said Garrison, astonished at his own boldness. But he had already suffered death a hundred times in anticipation and was beyond fearing it. Nothing mattered now. The Autarch frowned momentarily, but continued to size up his prisoner for a minute or so more.

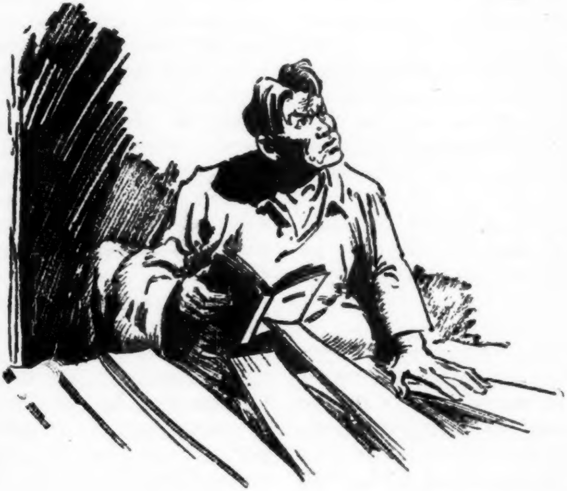
"A real rebel, a genuine, sincere dissenter," he said softly, "at last."

He moved across the room.

"Sit down," he said, "I want to talk with you."

Garrison sat down and took the proffered cigarette, wondering whether he was on the cruel end of the cat-and-mouse game.

"During my reign," said the Autarch, "I have long wanted to meet one of you. From time to time they have brought me what was alleged to be such. They were sniveling cowards all—stupid, lazy, careless or inept people who had infringed the Code without intent. They had to die, of course, and did. It is the rule, and I am as helpless in the face of it as anyone. But I did hope to find out what was wrong with the world. They could not tell me. Perhaps you can. There is more than one way of



dying, I may remind you, and I have considerable latitude in that matter."

"I see," said Garrison. Things were churning about inside his skull. There was the temptation to tell his captor what he wanted to hear and thereby earn a painless death. Yet he did not know what the Autarch wanted. Besides—

"The trouble with the world," said Garrison carefully, "is the Code itself. Civilization is an organism, made up of a myriad of lesser organisms. Organisms—men, animals, plants, and on down into the microcosm of minute life—are living things. They grow and develop and evolve. Or else they degenerate. They never stand still. Only the Code stands still. It is too rigid."

"I am not prepared to admit that," said the Autarch, "but go ahead. Prove your point if you can."

It was the opening Garrison hungered for. He recited the recent behavior of neomalitis—the strange turn it was taking, and the helplessness of the doctors in the face of an uncompromising Code. He explained how bacilli could differentiate into fresh and hardier strains, more contagious and deadlier than their predecessors. And how they might become immune to treatments formerly effective. Then he detailed his own experimentation, handicapped as that was by nonco-operation and the necessity of secrecy. He mentioned Clevering and his cornfields and emphasized the parallelism between the two situations. The conclusion was inescapable. However good the old procedures may have been in their day, they were not valid now. Radically new approaches were demanded.

"Perhaps," agreed the Autarch, thoughtfully. "There appears to be truth in what you say. I may as well tell you that other diseases are becoming rampant as well—new varieties of cholera, dysentery, and pneumonia. There is a wave of suicides, too. Cattle are dying. Many of our vital crops are failing from blight or insect attack. That is not all. Nonorganic things are awry. Despite controls, gradual shifts of population have thrown central power plants out of balance, and left us with highway systems that are either congested or disused."

"A city or region may be regarded as an organism, too," Garrison reminded him.

"So I see. At any rate, it is a problem that has weighed on me for some time. It is growing urgent. Something must be done, and quickly."

"I know that," said Garrison dryly.

"If," suggested the Autarch, "I should see my way clear to grant you an indefinite reprieve—perhaps amounting to a full pardon—would you undertake to bring the diseases mentioned under control?"

Garrison smiled a thin, hard smile.

"I am only one man, excellency, and an ill-equipped one at that. I happened to be lucky in stumbling on the remedy right off. In another case it might take an army of research workers years. Only by putting thousands of trained men at it in ample laboratories could such a thing be done."

"Very well. You are the new Director General of Health. I delegate you to find such men and modify the Medical Code."

"How?" asked Garrison, with a short, scornful laugh. "It is too late for that—by a half dozen generations. Not to modify the Code, but to find the men. The kind of men we need do not develop under an autarchian regime. It is the senseless persecution of your predecessors that has brought us to the brink of ruin, not the plant and animal parasites you complain of. Free men would have disposed of *them* long ago. But that would have required initiative and adaptability, traits long since obliterated. Now the premium is on blind obedience. Men have lost the art of thinking; they will only do what they are told."

"That makes it all the easier," said the Autarch, reaching for a pad. "You write the order stating what you want done. I will promulgate it. It is as simple as that."

Garrison stared at him in blank amazement.

"Order what?" he asked. "Men of force and talent to reveal themselves? Who is to judge whether they have those qualities? And if there are such, they will take immense pains to conceal themselves. They are afraid. I know that, because I know my own reaction to your recent order relaxing the Social Code. I didn't understand it, and I didn't trust it. For all I knew the Monitors might be listening and taking it all down."

"They were," said the Autarch, "but nothing happened. I was worrying about the state of affairs throughout the world, and hoped to pick up a clue as to what was wrong. There was only silence."

"Ah," said Garrison, grimly. "That shows the effect of fear. And the deadliness of inertia. There must be many men among our billions who see what is happening and care, but they dare not speak. They see only the Penal Houses ahead for their pains. As to the vast majority . . . bah, they are sheep. They are accustomed only to orders from above. Without positive orders specific to the last little detail, they will not act. What else do you expect from a race of slaves?"

"Slaves!" exclaimed the Autarch. "In the high position you held, how dare you compare yourself with a slave?"

"Wasn't I? I could cast about and find a sweeter euphemism for it, but essentially that was it. I have never known anything but regimentation. I was flattered with the label of a high cerebral rating, but why they assigned me to my job on the basis of it is more than I can understand. The commonest field hand above the moron class could have done the work I did. A machine could have. What use is intelligence if you are not permitted to use it?"

"Yes," admitted the Autarch slowly, "I see that now. But that was then. You are not only permitted to use yours now, but ordered to. Use any means you please to assure them immunity from persecution, but issue your call—"

"It will take more than negative action," Garrison reminded him. "To break away from a life of routine a man needs positive motivation. And I do not mean promotion to a job as sterile as the one he has. It will have to be one to fire his soul and kindle his mind. Simply writing an order will not suffice."

There was an interruption. The major-domo of the Palace brought in a folder of papers. It was the weekly summary of events in Autarchia. The Autarch studied it with a face of thunder, then handed it to Garrison.

It was a story of regression on all fronts. The worst news came from Asia, where the strange disease that resembled cholera but responded to none of its known controls was sweeping the continent. Millions were already dead, and every ship and stratoplane was spreading the epidemic farther.

"In the absence of anything better," Garrison remarked, "this should be isolated. You should declare an immediate quarantine."

"What is that?"

Garrison told him.

"That is out of the question," decided the Autarch, after a moment's consideration of what it implied. "It would be disastrous. The entire workings of the Code hinge on dependable supply and distribution. It—"

"It," flared Garrison, "shows you how rotten your precious system is. Even you, presumably the ablest man of us all, are stopped by it, though millions die. When things start cracking you're sunk. The holy framers thought they had attained perfection and saw no alternative. Well, cling to your sacred Code and ride to doom with it. But let's end this farce. Call your executioner and finish it."

They were both on their feet on the instant. The Autarch was visibly trying to control his anger, but Garrison was not to be stopped. The sickening sense of futility he first felt when Leona McWhisney died was back with him, a hundredfold more strong. His voice rose shrilly, and he threw discretion to the winds.

"The race is facing a life-and-death crisis," he shouted. "Pestilence is here, and famine is right around the corner. In the wake of those will come economic pandemonium The Grand Code cannot cope with them. It was not designed to. All it does is stifle us. What we need is men of imagination and boldness, not content with covering themselves by complying with some stereotyped provision of the Code. We need them by the tens of thousands, and we cannot find them on account of this unwieldy body of stupid, frozen laws. There is no time for temporizing. The Code has got to go—lock, stock and barrel!"

Garrison said a lot else along the same line. The Autarch heard him out in moody silence. Then he grasped him by the arm and led him to a side door.

"My apartment is in there. Go rest. I believe there is something in your argument, but I want to think."

That interview was the beginning of a curious friendship. They dined together that evening, and later talked far into the night.

By the end of the week Garrison came to appreciate that the office of Autarch was as empty as any in the realm. There, too, the dead hand of the past lay heavily. Being top dog of the pyramid of bureaucracy meant little, for in Autarchia precedent ruled. Autarchs had occasionally added to the Code, but not one had ever repealed a provision.

The books confiscated at the time of Garrison's arrest were sent for by the Autarch. He was amazed at their contents, and began to understand better the workings of his guest's mind. He liked the technical ones best; the one he could stomach least was the little essay by Mill. The idea of an individualistic society was beyond his com-

Give

AIR TRAILS
MODEL ANNUAL

Christmas!

THE perfect Christmas present for yourself or for anyone who is interested in aviation . . . and who isn't! The new 1944 AIR TRAILS MODEL ANNUAL contains 96 pages of every phase of model building . . . all developments in model-airplane activities! It covers design, construction, engines, sailplanes and everything you'd possibly want to know.

Then there's a special plan-book section in blue and white on heavy stock . . . three-view drawings of famous fighters and bombers of all nations . . . in 16 beautiful pages.

Construction plans for building different kinds . . . flying scale models of famous warplanes . . . and lots of pictures! Don't miss this opportunity to make someone's Christmas a very merry one . . . and your own as well!

AIR TRAILS
MODEL ANNUAL

25c (30c IN CANADA)
AT ALL NEWSSTANDS

If your dealer cannot supply you, fill out the coupon below. This offer good in U. S. only and not available to subscription agencies.

AIR TRAILS MODEL ANNUAL
79 Seventh Avenue
New York, 11, N. Y.

Inclosed is 25c (30c in Canada). Please send me the new AIR TRAILS MODEL ANNUAL.

Name ____________________

Address ____________________ Dist. No. ____

City ____________________ State ____

prehension, but on the whole he was impressed.

"Garrison," he said, "I am convinced you have more practical ideas than I. I am ready now to take advice. We will modify the Code for the emergency. You write the orders, I will issue them."

"I won't do it," said Garrison. "I don't know enough. And if I did, I still wouldn't. The principle is wrong."

"What principle?"

"The principle of handing down wisdom from aloft. The principle of autocracy, if you want to know. It is an evil thing. History has never produced a man who knew *everything*—"

"He can surround himself with advisers."

"Of his own picking," countered Garrison. "Yes-men they used to call them. Which is worse. It is a device to reinforce a dictator's illusions as to his own infallibility. What he needs is not a chorus of undiscriminating yessing, but frank and brutal criticism. He can get that only in a democracy."

"Democracy!" cried the Autarch scornfully. "Anarchy, you mean. What is a democracy but a howling mob of forty opinions, each as little informed as the next? Where, after an infinity of muddling and compromise, some self-styled leader manages to wheedle an agreement among fifty-one out of a hundred of the mass, whereupon he proclaims a half truth as the whole. That is clumsy nonsense. The world had democracies once. Look what happened to them!"

"Look at what is happening to their flawless successors," said Garrison quietly.

The Autarch reddened.

"At least," Garrison argued, "in a democracy the ordinary man had something to live for. He wasn't a poor pawn. If he hit on a good idea and had the will and personality to promote it, he had a chance of getting somewhere. He didn't vegetate or degenerate into the flesh-and-blood robots we have about us now. Competition with his fellows kept him from doing that. Sure, he made errors. But he did not make the stupidest of all—of freezing them into an inflexible Code. Where freedom is, a man can develop. If he is wrong, others are free to say so. Some will back him, others oppose, which is the very thing the framers of the Code thought so deplorable. But out of the conflict the better idea usually won."

"After years of wrangling and with many setbacks," objected the Autarch.

"Rather, after continual adjustments to current needs," corrected Garrison. "Democracy may have had its faults, but lack of adaptability was not one of them. In freedom of speech and reasonable freedom of action it had the machinery for correcting any intolerable fault. Which is more than you can say for your own absurd system."

"All right," retorted the Autarch. "For argument's sake suppose I grant your point. *How,* in view of the sheeplike nature of my people which you keep harping on, could we reinstitute an obsolete form of society such as you advocate? I offered 'em free speech, and you know what happened."

"Wake 'em up," yelled Garrison. "Make 'em mad. Then you'd see."

"With no Code to guide them? I see nothing but chaos."

"We needn't repeal the whole of the Code. Considered as a guide it isn't bad at all. Its evil feature is its pretence of being infallible. We'll teach the people how to judge when to follow and when to diverge."

"That from you," snorted the Autarch. "You, who wouldn't even tackle the revision of the Medical Code! Now you propose to upset the entire applecart, and destroy the people's confidence. What will you replace it with, and how?"

"What with?" smiled Garrison. "There is always your great sealed library. You have seen a small sample of it and liked it. The Code was based on it. It must be good. As to how, that will come later."

"Let's look," said the Autarch, with sudden resolution. He dug keys and combinations out of a safe.

They reached the library through a long underground passage heavy with the dust of time. Once they passed the guards at the outer barrier they were on pavement untrod for decades. Then they came to a heavy circular door that had to be opened by a complicated group of methods. At length it swung open and they stepped through.

Both gasped at the immensity of the place. Not every book ever published was there—only the ones considered by the framers in compiling the Code. But since they covered every field of human activity in utmost detail, they numbered in the millions. The stacks stretched away for thousands of feet of well-lit, air conditioned space. The magnitude of the task they had so lightly assumed almost overwhelmed them.

After a long hunt Garrison found the medical section. He was again appalled at the extent of it, for the volumes dealing with any single aspect of his profession took up yards of shelving. He skipped histology, obstetrics, dermatology, and dozens more. There was just too much of it. How was he ever to read it all, let alone sift the chaff from the substance? He ducked the questions neatly by concentrating on the volumes devoted to the techniques of research.

Meanwhile the Autarch was delving elsewhere. He was deep among the histories and philosophies, with occasional excursions into political economy. Soon the aisles where he roamed were cluttered with "must" books. His first samplings had produced material for half a lifetime of study.

Hours later they left the place, exhausted, but burdened with books. Sheer fatigue cut their dinner talk that night to the barest minimum.

"How can we know," groaned the Autarch, "what part of this stuff is bad, and what not?"

"We'll have to leave it to the people," was Garrison's reply. "We need too many people and in too many varied fields to try to select for them. They will have to do that themselves."

"That will bring chaos, I say," grumbled the Autarch. "Anarchy. Your cure is as bad as the disease, I'm afraid."

"All right," grinned Garrison, as a sudden inspiration hit him. "I'm an anarchist. Let's analyze it. Autocracy is the complete denial of the individual. Anarchy is his fullest possible assertion. Democracy lies halfway between. Under it an individual can be himself, but is subject to certain restraints. Very well. You continue to play the Autarch. I'll be the Anarch—"

"And between us we'll produce the Demagogue," remarked the Autarch, sharing his grin. "A fascinating gamble, I must say. And pray tell, my insane friend, how do we achieve this miracle?"

"You continue to issue edicts."

"Yes?"

"And I will see that they are not obeyed," chuckled Garrison.

Strange happenings came to pass shortly after that. The sprawling radio center known as Omnivox overflowed into adjoining buildings hastily remodeled as annexes. Peremptory calls were sent out to Propags all over the world. Soon they came streaming into Cosmopolis on every arriving stratoliner. There they met a puzzling individual—one Philip Garrison, the newly appointed Chief of Propaganda. He told them that for one month they would read and not talk. In the meantime the standard lecture courses were to be suspended.

At the same time the citizens of the provinces were treated to a bewildering succession of orders. The Grand Code, they were informed, was to be revised in the near future. Until that time they should continue to use it as a guide, but might depart from it in certain stated emergencies. Propag lectures stopped as the lecturers were withdrawn, but the culture courses were continued for the time being. There was a difference, though. An army of carpenters descended on the various Social Halls and cut them up into many small compartments by partitions. Each was fitted with an omnivox screen. The most startling innovation was the broadcast instructions to the Monitor Corps. They were forbidden to molest dissenters. On the contrary, they were given strict orders to protect them from the orthodox, should those show signs of resenting their heresies.

The results as both Autarch and Garrison had anticipated, were meager. They listened in at random over the monitorial wires and knew. For a few days there was a buzz of excitement, then the people relapsed into their customary apathy. They continued to do the things they always had done, and in exactly the same manner. In all the world there were less than five hundred who took the strange edicts at anything like face value. Some were doctors, who now openly experimented as Garrison had done. The rest were in other professions.

The Autarch wanted to send for them and add them to his staff.

"No," said Garrison, "they will be more useful where they are. Moreover, if you do that you may scare others. There must be more than half a thousand alert minds on five continents. We've still got those to smoke out."

The preliminaries took the whole of the estimated month. The zero hour was near at hand. The Propags had finished their assigned readings and had prepared their scripts. The Autarch was signing them at the rate of hundreds at a time, using a giant pantograph. Each was in the form of an edict, almighty law to replace a portion of the outmoded Grand Code. For the first few hours he tried to read them as they came, but there were too many. He gave it up and went ahead with his part of the bargain—signing orders, for in the end he and Garrison had arrived at a complete understanding. Now he meant to see it through, though the skies fell.

He checked off the subjects on his lists as the edicts went on their way. There appeared to be one set missing. He sent for Garrison. Garrison was busy at the time coaching the regiment of omnivox announcers he had recruited.

"What about religion?" asked the Autarch. "There was about an acre of books on it, as I remember."

"Oh, yes, religion," said Garrison, thoughtfully. "Yes, I suppose we ought to include that, though I omitted it because it was one of the activities abolished altogether."

"I think we'd better give it to 'em," said the Autarch. "People used to think a lot of it. They fought over it. It had something to do with the spirit, I believe, and we certainly need pepping up in that direction."

"Yes," agreed Garrison. "What kind shall I dish out?"

"How would I know? Let 'em have all of it."

BEFORE YOU TURN THIS PAGE—

why not make sure that you continue to receive this magazine throughout the year? Don't take the chance that your newsstand will be sold out—act now! Simply by filling out this coupon you can insure a solid year of reading pleasure with your favorite fiction.

ASTOUNDING SCIENCE-FICTION
122 EAST 42ND STREET
NEW YORK 17, N. Y.

Inclosed is $2.50. Kindly send me a year's subscription to ASTOUNDING SCIENCE-FICTION.

NAME ....
ADDRESS ....
CITY ....STATE.......

So Garrison put another hundred script writers to work.

At last the zero hour came. Garrison was in the master control room of Omnivox with stop watch in hand. At his nod the talkers went into action. It was the hour when the citizens in his part of the world were assembled in the Social Halls. At later hours the same discourses would follow the sun around the globe. Then he went off to his private booth and plugged in on a spyline. For a sample spot he picked on the Hall at his old home Dorm. It was different now. Instead of being scattered groups in one big hall, the doctors and agronomists were segregated in many small rooms. Each was listening to a different lecture. Garrison chose to follow the doctors.

In the first room a group of them were listening rapt to the new orders that were to replace the Code. The voice proclaiming that particular one was reading from a script that declared that most bodily ills had endocrine gland imbalance as their cause. Hence glandular therapy would cure anything. Garrison listened to it well pleased. It was most convincing. Then he switched over to another room. There, other doctors heard the new law of the land. It asserted that diet was nine tenths of the battle. Feed a man right and he would become practically immortal.

Garrison smiled and went on to the next. The lecturer was quoting osteopathic doctrine. The disposition of the bones had everything to do with disease. It was fundamental. Garrison flicked the switch again. The next fellow was yelling about the dangers of ever-present bacteria and demanding strict attention to the sterile technique. On and on it went, in each room a different set of dogma. And each of them was sound enough as far as it went, except that each was emphasized at the expense of every other. All the cults and schisms of old-style medicine were there.

Garrison grinned happily. He could not predict with any exactness what the outcome would be, but he knew it would be worth watching. Then he turned to other fields where similar conflicting lectures were being read. The announcers were doing well; he was content.

"How'm I doing?" he asked the Autarch, ten days later.

"Swell, I guess," said the Autarch dubiously, "if chaos is what you're driving at. There are riots all over the place. I ordered a new bridge built across the river ten miles below here. I had to send a squad of monitors to restore order."

"Yes?"

"Four pontifexes of the steel arch persuasion ganged up one who stood out for a suspension bridge. A fellow who happened to think cantilevers are better horned into the argument and got battered in the melee. Pretty bloody affair."

"They'll learn," said Garrison cheerily. "And when they do, they will not only know what is the best type, but why. They'll feel all the better for it. That's the democratic way."

"Maybe," said the Autarch grudgingly, and added with a twinkle, "You have a thing or two to learn, too."

"Now what?"

"Discrimination. Do you know what happened at Chicago? Better check over your scheduling of religious stuff. They've been preaching Hinduism out there. Now we have a strike on our hands. Hindus won't kill cows, it seems."

In the succeeding six months pandemonium broke loose. It was all according to plan, but trying. The world's population had been divided into cells, and each cell ordered to believe in some particular method and carry it out in the face of every opposition. Since no two groups were taught alike in the same locality, friction developed almost immediately in the citizens' daily work. On Sundays, when all were thrown together for an afternoon of free discussion, the monitors had their work cut out for them. They found their new instructions as to preserving order the biggest job in their history.

But Garrison listened in with glee. The only way to reach the populace was through flat, categorical orders. It was the conflict of orders, each reasonable and workable of itself but incompatible with the others, that was waking them up. Men got angry, and backed up the reasons fed them by the Propags with ones thought up by themselves. Still others were unsettled by their opponents, and wrote troubled letters to their higher-ups asking for clarification. Since their higher-ups were equally as confused, the letters eventually reached the palace. Garrison faithfully recorded their names on a gold-starred list.

"There," he said to the Autarch, "are some of the men you asked for."

"Humph," exclaimed the dictator, "I am getting a lot more than I asked for. Riots. Revolution. Call it democracy if you want to, but anarchy is what it is. You stirred 'em up, I admit, but what has it got us? A nation at one another's throats. I don't like it. Summon the best of these men you've found and direct them to draw up a new Code. Then—"

"Then we'll be right back where we started," Garrison broke in. You can't put mankind in a strait jacket and expect anything but atrophy. When our thinking is done for us we become stupid. There is a saying that Nature abhors a vacuum. She also abhors an idler. The unused limb withers and dies."

"But listen to the noise outside," said the Autarch, "they'll be killing each other next."

There was plenty of tumult outside, all right. All Cosmopolis was lit with red flares, and the night was hideous with the roar of crowds and the ranting of stump orators.

Autarch and Anarch stole out onto a balcony where they could better see and overhear. A political parade was passing, waving banners aloft that called for the establishment of a monarchy. It met another head-on, a group yelling for an election and the adoption of a constitution. The monitors intervened, swinging nightsticks, and dispersed both crowds. But the relative quiet that followed was short lived. A mob howling "Death to Mohammedans" poured out of a side street. When the monitors finished with them their placards and banners were in shreds.

"I think you overdid the religious angle," remarked the Autarch dryly.

"Yes," admitted Garrison glumly. "I had no idea they would take it so seriously. After all, we don't actually know much about the soul. Ours have been in a state of suspended animation for a long time."

"I know, but don't you think we might be a little more . . . ah-uh . . . *selective* in what we put out. Now that sect we just saw in action, for example—"

"At least we gave the monitors only one set of instructions—to maintain order," said Garrison, doggedly sticking to his guns. "The few broken heads we see are worth the price. It will all work out. Have patience."

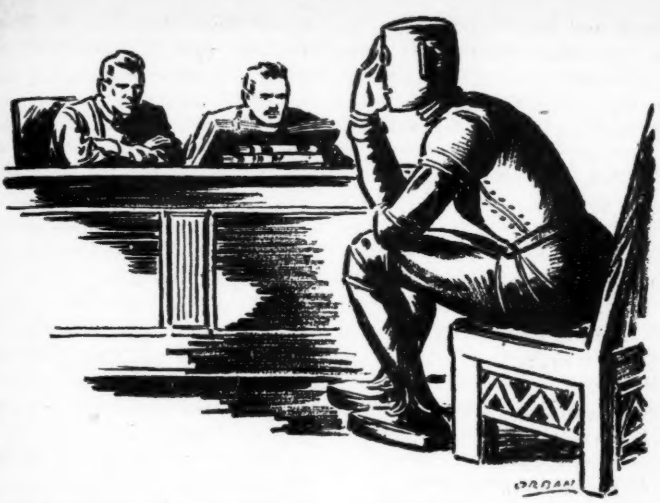
It did work out. The Propags had done their job. The seeds had been sown and now the crop was coming up. Controls were being established over diseases and blights again. Other able men were untangling the economic mess resulting from those. Still others were observing and approving them. The Codes were not being used much any more. People attacked their problems directly, and were learning the art of compromise. There was but one thing left to do.

The Autarch was reluctant to do it, but he had gone so far that he was willing to go all the way. He revoked the Code, including the fantastic recent additions. The printers that formerly made up its volumes were now turning out copies of the books in the secret library. The only portion of the Code retained was the completely revised Social Code. Into it Garrison wrote the bill of rights and the laws compelling tolerance, and appended instructions for forming a representative government. He abolished the practice of holding men in jobs by virtue of their cerebral ratings. It might come out to the same thing, and might not. Hereafter results were all that would count.

It was the Autarch who issued the call for the elections, and of his own volition. That was months later, after the new Code had been digested.

"Do you know, Garrison," he said, "this anarchy of yours is panning out pretty well. But I've worked myself out of a job. I think I'll run for president."

THE END.



Catch That Rabbit

by ISAAC ASIMOV

When a machine breaks down and stops, an expert can usually fix it. But their problem was a robot that went crazy—became homicidal—only when there were no homos to cide!

Illustrated by Orban

Michael Donovan's face went beety, "For the love of Pete, Greg, get realistic. What's the use of adhering to the letter of the specifications and watching the test go to pot? It's about time you got the red tape out of your pants and went to work."

"I'm only saying," said Gregory Powell patiently, as one explaining electronics to an idiot child, "that according to spec, those robots are equipped for asteroid mining without supervision. We're not supposed to watch them."

"All right. Look—logic!" He lifted his hairy fingers and pointed. "One: That new robot passed every test in the home laboratories. Two: United States Robots guaranteed their passing the test of actual performance on an asteroid. Three: The robots *aren't* passing said tests. Four: If they don't pass, United

States Robots lose ten million credits in cash and about one hundred million in reputation. Five: If they don't pass and we can't explain why they don't pass, it is just possible two good jobs may have to be bidden a fond farewell."

Powell groaned heavily behind a noticeably insincere smile. The unwritten motto of United States Robot and Mechanical Men Corp. was well-known: "No employee makes the same mistake twice. He is fired the first time."

Aloud he said, "You're as lucid as Euclid with everything except facts. You've watched that robot group for three shifts, you redhead, and they did their work perfectly. You said so yourself. What else can we do?"

"Find out what's wrong, that's what we can do. So they *did* work perfectly when I watched them. But on three different occasions when I *didn't* watch them, they didn't bring in any ore! They didn't even come back on schedule. I had to go after them."

"And was anything wrong?"

"Not a thing. Not a thing. Everything was perfect. Smooth and perfect as the luminiferous ether. Only one little insignificant detail disturbed me—*there was no ore.*"

Powell scowled at the ceiling and pulled at his brown mustache. "I'll tell you what, Mike. We've been stuck with pretty lousy jobs in our time, but this takes the iridium asteroid. The whole business is complicated past endurance. Look, that robot, DV-5, has six robots under it. And not just under it—they're *part* of it."

"I know that—"

"Shut up!" said Powell, savagely. "I know you know it, but I'm just describing the *hell* of it. Those six subsidiaries are part of DV-5 like your fingers are part of you, and it gives them their orders neither by voice nor radio, but directly through positronic fields. Now—there isn't a roboticist back at United States Robots that knows what a positronic field is or how it works. And neither do I . . . and neither do you."

"The last," agreed Donovan, philosophically, "I know."

"Then look at our position. If everything works—fine! If anything goes worng—we're up Trash Creek, without any oar. We're on the spot, Mike." He blazed away for a moment in silence. Then, "All right, have you got him outside?"

"Yes."

"Is everything normal now?"

"Well, he hasn't got religious mania, and he isn't running around in a circle spouting Gilbert and Sullivan, so I suppose he's normal."

Donovan passed out the door, shaking his head viciously.

Powell reached for the "Handbook of Robotics" that weighed down one side of his desk to a near-founder and opened it reverently. He had once jumped out of the window of a burning house dressed only in shorts and the

"Handbook." In a pinch, he would have skipped the shorts.

The "Handbook" was propped up before him, when Robot DV-5 entered, with Donovan kicking the door shut behind him.

Powell said somberly, "Hi, Dave. How do you feel?"

"Fine," said the robot. "Mind if I sit down?" He dragged up the specially reinforced chair that was his, and folded gently into it.

Powell regarded Dave—laymen might think of robots by their serial numbers; roboticists never—with approval. It was not over-massive by any means, in spite of its construction as thinking-unit of an integrated seven-unit robot team. It was seven feet tall, and a lousy half-ton of metal and electricity. A lot? Not when that half-ton has to be a mass of condensers, circuits, relays, and vacuum cells that can handle practically any psychological reaction known to humans. *And* a positronic brain, which with ten pounds of matter and a few quintillion quintillions of positrons runs the whole show.

Powell groped in his shirt pocket for a loose cigarette. "Dave," he said, "you're a good fellow. There's nothing flighty or prima donna-ish about you. You're a stable, rock-bottom mining robot, except that you're equipped to handle six subsidiaries in direct co-ordination. As far as I know, that has not introduced any unstable paths into your brain-path map."

The robot nodded, "That makes me feel swell, but what are you getting at, boss?" He was equipped with an excellent diaphragm, and the presence of overtones in the sound unit robbed him of much of that metallic flatness that marks the usual robot voice.

"I'm going to tell you. With all that in your favor, what's going wrong with your job? For instance, today's B-shift?"

Dave hesitated, "As far as I know, nothing."

"You didn't produce any ore."

"I know."

"Well, then—"

Dave was having trouble, "I can't explain that, boss. It's been giving me a case of nerves, or it would if I let it. My subsidiaries worked smoothly. I know *I* did." He considered, his photoelectric eyes glowing intensely. Then, "I don't remember. The day ended and there was Mike and there were the ore cars, mostly empty."

Donovan broke in, "You didn't report at shift-end those days, Dave. You know that?"

"I know. But as to why—" He shook his head slowly and ponderously.

Powell had the queasy feeling that if the robot's face were capable of expression, it would be one of pain and mortification. A robot, by its very nature, cannot bear to fail its function.

Donovan dragged his chair up to Powell's desk and leaned over, "Amnesia, do you think?"

"Can't say. But there's no use in trying to pin disease names on this. Human disorders apply to robots only as romantic analogies. They're no help to robotic engineering." He scratched his neck, "I hate to put him through the elementary brain-reaction tests. It won't help his self-respect any."

He looked at Dave thoughtfully and then at the Field-Test Outline given in the "Handbook." He said, "See here, Dave, what about sitting through a test. It would be the wise thing to do."

The robot rose, "If you say so, boss." There *was* pain in his voice.

It started simply enough. Robot DV-5 multiplied five-place figures to the heartless ticking of a stop watch. He recited the prime numbers between a thousand and ten-thousand. He extracted cube roots and integrated functions of varying complexity. He went through mechanical reactions in order of increasing difficulty. And, finally, worked his precise mechanical mind over the highest function of the robot world—the solution of problems in judgment and ethics.

At the end of two hours, Powell was copiously be-sweated, Donovan had enjoyed a none-too-nutritious diet of fingernail and the robot said, "How does it look, boss?"

Powell said, "I've got to think it over, Dave. Snap judgments won't help much. Suppose you go back to the C-shift. Take it easy. Don't press too hard for quota just for a while—and we'll fix things up."

The robot left. Donovan looked at Powell.

"Well—"

Powell seemed determined to pull up his mustache by the roots. He said, "There is nothing wrong with the currents of his positronic brain."

"I'd hate to be that certain."

"Oh, Jupiter, Mike! The brain is the surest part of a robot. It's quintuple-checked back on Earth. If they pass the field test perfectly, the way Dave did, there just isn't a *chance* of brain mis-function. That test covered every key path in the brain."

"So where are we?"

"Don't rush me. Let me work this out. There's still the possibility of a mechanical breakdown in his body. That leaves about fifteen hundred condensers, twenty thousand individual electric circuits, five hundred vacuum cells, a thousand relays, and upty-ump thousand other individual pieces of complexity that can be wrong. *And* these mysterious positronic fields no one knows anything about."

"Listen, Greg," Donovan grew desperately urgent. "I've got an idea. That robot may be lying. He never—"

"Robots can't knowingly lie, you fool. Now if we had the McCormack-Wesley tester, we could check each individual item in his body within twenty-four to forty-eight hours, but the only two M.-W. testers existing are on Earth, and they weigh ten tons, are on concrete foundations, and can't be moved. Isn't that peachy?"

Donovan pounded the desk, "But, Greg, he only goes wrong when we're not around. There's something—sinister—about—that." He punctuated the sentence with slams of fist against desk.

"You," said Powell, slowly, "make me sick. You've been reading adventure novels."

"What I want to know," shouted Donovan, "is what we're going to do about it."

"I'll tell you. I'm going to install a visiplate right over my desk. Right on the wall over there, see!" He jabbed a vicious finger at the spot. "Then I'm going to focus it at whatever part of the mine is being worked, and I'm going to watch. That's all."

"That's all? Greg—"

Powell rose from his chair and leaned his balled fists on the desk, "Mike, I'm having a hard time." His voice was weary. "For a week, you've been plaguing me about Dave. You say he's gone wrong. Do you know *how* he's gone wrong? No! Do you know what shape this wrongness takes? No! Do you know what brings it on? No! Do you know what snaps him out? No! Do you know *anything* about it? No! Do *I* know anything about it? No! So what do you want me to do?"

Donovan's arm swept outward in a vague, grandiose gesture, "You got me!"

"So I tell you again. Before we do anything towards a cure, we've got to find out what the disease is in the first place. The first step in cooking rabbit stew is catching the rabbit. Well, we've got to catch that rabbit! Now get out of here."

Donovan stared at the preliminary outline of his field report with weary eyes. For one thing, he was tired and for another, what was there to report while things were unsettled? He felt resentful.

He said, "Greg, we're almost a thousand tons behind schedule."

"You," replied Powell, never looking up, "are telling me something I don't know."

"What I want to know," said Donovan, in sudden savagery, "is why we're always tangled up with new-type robots. I've finally decided that the robots that were good enough for my great-uncle on my mother's side are good enough for me. I'm for what's tried and true. The test of time is what counts—good, solid, old-fashioned robots that never go wrong."

Powell threw a book with perfect aim, and Donovan went tumbling off his seat.

"Your job," said Powell, evenly, "for the last five years has been to test new robots under actual working conditions for United States Robots. Because you and I have been so injudicious as to display proficiency at the task, we've been rewarded with the dirtiest jobs. That," he jabbed holes in the air with his finger in Donovan's direction, "is your work. You've been griping about it, from personal memory, since about five minutes after United States Robots signed you up. Why don't you resign?"

"Well, I'll tell you." Donovan rolled onto his stomach, and took a firm grip on his wild, red hair to hold his head up. "There's a certain principle involved. After all, as a trouble shooter, I've played a part in the development of new robots. There's the principle of aiding scientific advance. But don't get me wrong. It's not the principle that keeps me going; it's the money they pay us. *Greg!"*

Powell jumped at Donovan's wild shout, and his eyes followed the redhead's to the visiplate, when they goggled in fixed horror. He whispered, "Holy—howling—Jupiter!"

Donovan scrambled breathlessly to his feet, "Look at them, Greg. They've gone *nuts."*

Powell said, "Get a pair of suits. We're going out there."

He watched the posturings of the robots on the visiplate. They were bronzy gleams of smooth motion against the shadowy crags of the airless asteroid. There was a marching formation now, and in their own dim body light, the rough-hewn walls of the mine tunnel swam past noiselessly, checkered with misty erratic blobs of shadow. They marched in unison, seven of them, with Dave at the head. They wheeled and turned in macabre simultaneity; and melted through changes of formation with the weird ease of chorus dancers in Lunar Bowl.

Donovan was back with the suits, "They've gone jingo on us, Greg. That's a military march."

"For all you know," was the cold response, "it may be a series of calisthenic exercises. Or Dave may be under the hallucination of being a dancing master. Just you think first, and don't bother to speak afterward, either."

Donovan scowled and slipped a detonator into the empty side holster with an ostentatious shove. He said, "Anyway, there you are. So we work with new-model robots. It's our job, granted. But answer me one question. Why . . . *why* does something invariably go wrong with them?"

"Because," said Powell, somberly, "we are accursed. Let's go!"

Far ahead through the thick velvety blackness of the corridors that reached past the illuminated circles of their flashlights, robot light twinkled.

"There they are," breathed Donovan.

Powell whispered tensely, "I've been trying to get him by radio but he doesn't answer. The radio circuit is probably out."

"Then I'm glad the designers haven't worked out robots who can work in total darkness yet. I'd hate to have to find seven mad robots in a black pit without radio communication, if they *weren't* lit up like blasted radioactive Christmas trees."

"Crawl up on the ledge above, Mike. They're coming this way, and I want to watch them at close range. Can you make it?"

Donovan made the jump with a grunt. Gravity was considerably below Earth-normal, but with a heavy suit, the advantage was not too great, and the ledge meant a near ten-foot jump. Powell followed.

The column of robots were trailing Dave single-file. In mechanical rhythm, they converted to double and returned to single in different order. It was repeated over and over again and Dave never turned his head.

Dave was within twenty feet when the play-acting ceased. The subsidiary robots broke formation, waited a moment, then clattered off into the distance—very rapidly. Dave looked after them, then slowly sat down. He rested his head in one hand in a very human gesture.

His voice sounded in Powell's earphones, "Are you here, boss?"

Powell beckoned to Donovan and hopped off the ledge.

"O.K., Dave, what's been going on?"

The robot shook his head, "I don't know. One moment I was handling a tough outcropping in Tunnel 17, and the next I was aware of humans close-by, and I found myself half a mile down main-stem."

"Where are the subsidiaries now?" asked Donovan.

"Back at work, of course. How much time has been lost?"

"Not much. Forget it." Then to Donovan, Powell added "Stay with him the rest of the shift. Then, come back. I've got a couple of ideas."

It was three hours before Donovan returned. He looked tired.

Powell said, "How did it go?"

Donovan shrugged wearily, "Nothing ever goes wrong when you watch them. Throw me a butt, will you?"

The redhead lit it with exaggerated care and blew a careful smoke ring. He said, "I've been working it out, Greg. You know, Dave has a queer background for a robot. There are six others under him in an extreme of regimentation. He's got life and death power over those subsidiary robots and it *must* react on his mentality. Suppose he finds it necessary to emphasize this power as a concession to his ego."

"Get to the point."

"It's right here. Suppose we have militarism. Suppose he's fashioning himself an army. Suppose he's training them in military maneuvers. Suppose—"

"Suppose you go soak your head. Your nightmares must be in technicolor. You're postulating a major aberration of the positronic brain. If your analysis were correct, Dave would have to break down the First Law of Robotics: that a robot may not injure a human being or, through inaction, allow a human being to be injured. The type of militaristic attitude and domineering ego you propose must have as the end-point of its logical implications, domination of humans."

"All right. How do you know that isn't the fact of the matter?"

"Because any robot with a brain like that would, one, never have left the factory, and two, be spotted immediately if it ever was. I tested Dave, you know."

Powell shoved his chair back and put his feet on the desk. "No. We're still in the position where we can't make our stew because we haven't caught our rabbit. We still haven't the slightest notion as to what's wrong. For instance, if we could find out what that danse macabre we witnessed was all about, we'd be on the way out."

He paused, "Now listen, Mike, how does this sound to you? Dave goes wrong only when neither of us are present. And when he is wrong, the arrival of either of us snaps him out of it."

"I once told you that was sinister."

"Don't interrupt. How is a robot different when humans are not present? The answer is obvious. There is a larger requirement of personal initiative. In that case, look for the body parts that are affected by the new requirement."

"Golly." Donovan sat up straight, then subsided. "No, no. Not enough. It's too broad. It doesn't cut the possibilities much."

"Can't help that. In any case, there's no danger of not making quota. We'll take shifts watching those robots through the visor. Any time anything goes wrong, we get to the scene of action immediately. That'll put them right."

"But the robots will fail spec anyway, Greg. United States Robots can't market DV models with a report like that."

"Obviously. We've got to locate the error in make-up and correct it—and we've got ten days to do it in." Powell scratched his head. "The trouble is . . . well, you'd better look at the blueprints yourself."

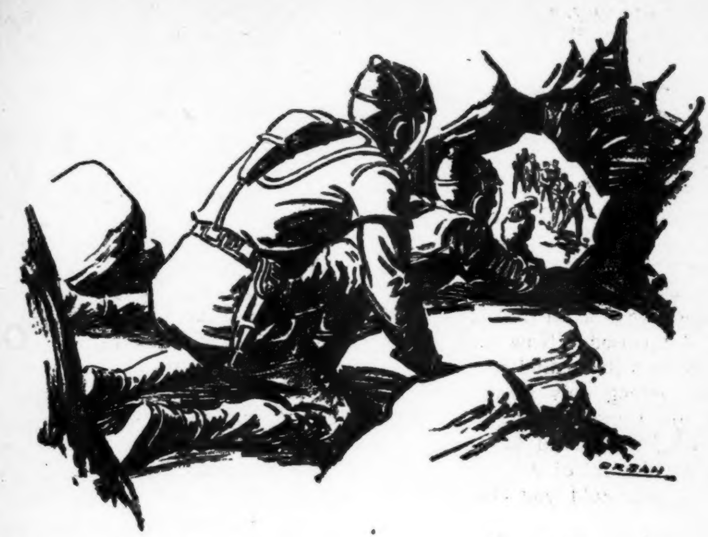
The blueprints covered the floor like a carpet and Donovan crawled over the face of them following Powell's erratic pencil.

Powell said, "Here's where you come in, Mike. You're the body specialist, and I want you to check me. I've been trying to cut out all circuits not involved in the personal initiative hookup. Right here, for instance, is the trunk artery involving mechanical operations. I cut out all routine side-routes as emergency divisions—" He looked up, "What do you think?"

Donovan had a very bad taste in his mouth, "The job's not that simple, Greg. Personal initiative isn't an electric circuit you can separate from the rest and study. When a robot is on his own, the intensity of body activity increases immediately on almost all fronts. There isn't a circuit entirely unaffected. What must be done is to locate the particular condition—a very specific condition—that throws him off, and *then* start eliminating circuits."

Powell got up and dusted himself, *"Hmph.* All right. Take away the blueprints and burn them."

Donovan said, "You see when activity intensifies, anything can



happen, given one single faulty part. Insulation breaks down, a condenser spills over, a connection sparks, a coil overheats. And if you work blind, with the whole robot to choose from, you'll never find the bad spot. If you take Dave apart and test every point of his body mechanism one by one, putting him together each time, and trying him out—"

"All right. All right. I can see through a porthole, too."

They faced each other hopelessly, and then Powell said cautiously, "Suppose we interview one of the subsidiaries."

Neither Powell nor Donovan had ever had previous occasion to talk to a "finger." It *could* talk; it wasn't *quite* the perfect analogy to a human finger. In fact, it had a fairly developed brain, but that brain was tuned primarily to the reception of orders via positronic field, and its reaction to independent stimuli was rather fumbling.

Nor was Powell certain as to its name. Its serial number was DV5-2, but that wasn't very useful.

He compromised. "Look, pal," he said, "I'm going to ask you to do some hard thinking and then you can go back to your boss."

The "finger" nodded its head stiffly, but did not exert its limited brain-power on speech.

"Now on four occasions recently," Powell said, "your boss deviated from brain-scheme. Do you remember those occasions?"

"Yes, sir."

Donovan growled angrily, *"He* remembers. I tell you there's something very sinister—"

"Oh, go bash your skull. Of course the 'finger' remembers. There's nothing wrong with *him."* Powell turned back to the robot, "What were you doing each time . . . I mean the whole group."

The "finger" had a curious air of reciting by rote, as if he answered questions by the mechanical pressure of his brain pan, but without any enthusiasm whatever.

He said, "The first time we were at work on a difficult outcropping in Tunnel 17, Level B. The second time we were buttressing the roof against a possible cave-in. The third time we were preparing accurate blasts in order to tunnel further without breaking into a subterranean fissure. The fourth time was just after a minor cave-in."

"What happened at these times?"

"It is difficult to describe. An order would be issued, but before we could receive and interpret it, a new order came to march in queer formation."

Powell snapped out, "Why?"

"I don't know."

Donovan broke in tensely, "What was the first order . . . the one that was superseded by the marching directions?"

"I don't know. I sensed that an order was sent, but there was never time to receive it."

"Could you tell us *anything* about it? Was it the same order each time?"

The "finger" shook his head unhappily, "I don't know."

Powell leaned back, "All right, get back to your boss."

The "finger" left, with visible relief.

Donovan said, "Well, we accomplished a lot that time. That was real sharp dialogue all the way through. Listen, Dave and that imbecile 'finger' are both holding out on us. There's too much they don't know and don't remember. We've got to stop trusting them, Greg."

Powell brushed his mustache the wrong way, "So help me, Mike, another fool word out of you, and I'll take away your rattle and teething ring."

"All right. You're the genius of the team. I'm just a poor sucker. Where do we stand?"

"Right behind the eight ball. I tried to work it backwards through the 'finger', and couldn't. So we've got to work it forwards."

"A great mind," marveled Donovan. "How simple that makes it. Now translate that into English, master."

"Translating it into baby talk would suit you better. I mean that we've got to find out what order it is that Dave gives just before everything goes black. It would be the key to the business."

"And how do you expect to do that? We can't get close to him, because nothing will go wrong as

A message for you . . . from 1953

(Today, John Jones is just an average American, wrestling with all the doubts and worries and problems that beset every one of us right now. But let's skip ahead 10 years. Let's look at John Jones then—*and listen to him . . .)*

"SOMETIMES I feel so good it almost scares me.

"This house—I wouldn't swap a shingle off its roof for any other house on earth. This little valley, with the pond down in the hollow at the back, is the spot I like best in all the world.

"And they're mine. I own 'em. Nobody can take 'em away from me.

"I've got a little money coming in, regularly. Not much—but enough. And I tell you, when you can go to bed every night with nothing on your mind except the fun you're going to have tomorrow—that's as near Heaven as a man gets on this earth!

"It wasn't always so.

"Back in '43—that was our second year of war, when we were really getting into it—I needed cash. Taxes were tough, and then Ellen got sick. Like most everybody else, I was buying War Bonds through the Payroll Plan—and I figured on cashing some of them in. But sick as she was, it was Ellen who talked me out of it.

"'Don't do it, John!' she said. '*Please* don't! For the first time in our lives, we're really saving money. It's *wonderful* to know that every single payday we have *more* money put aside! John, if we can only keep up this saving, think what it can mean! Maybe someday you won't have to work. Maybe we can own a home. And oh, how good it would feel to know that we need never worry about money when we're old!'

"Well, even after she got better, I stayed away from the weekly poker game—quit dropping a little cash at the hot spots now and then—gave up some of the things a man feels he has a right to. We made clothes do—cut out fancy foods. We didn't have as much fun for a while but we paid our taxes and the doctor and—we didn't touch the War Bonds.

"We didn't touch the War Bonds then, or any other time. And I know this: The world wouldn't be such a swell place today if we had!"

★ *The Treasury Department acknowledges with appreciation the publication of this advertisement by* ★

STREET & SMITH PUBLICATIONS, INC.

long as we're there. We can't catch the orders by radio because they are transmitted via this positronic field. That eliminates the close-range and the long-range method, leaving us a neat, cozy zero."

"By direct observation, yes. There's still deduction."

"Huh?"

"We're going on shifts, Mike." Powell smiled grimly. "And we're not taking our eyes off the visiplate. We're going to watch every action of those steel headaches. When they go off into their act, we're going to see what happened immediately before and we're going to *deduce* the order."

Donovan opened his mouth and left it that way for a full minute. Then he said in strangled tones, "I resign. I quit."

"You have ten days to think up something better," said Powell wearily.

Which, for eight days, Donovan tried mightily to do. For eight days, on alternate four-hour shifts, he watched with aching and bleary eyes those glinty metallic forms move against the vague background. And for eight days, in the four-hour in-betweens, he cursed United States Robots, the DV models, and the day he was born.

And then on the eighth day, when Powell entered with an aching head and sleepy eyes for his shift, Donovan stood up and with very careful and deliberate aim launched a heavy book end for the exact center of the visiplate. There was a very appropriate splintering noise.

Powell gasped, "What did you do that for?"

"Because," said Donovan, almost calmly, "I'm not watching it any more. We've got two days left and we haven't found out a thing. DV-5 is a lousy loss. He's stopped five times since I've been watching and three times on your shift, and I can't make out what orders he gave, and you couldn't make it out. And I don't believe you could ever make it out because I know *I* couldn't ever.

"Jumping Space, how can you watch six robots at the same time. One makes with the hands, and one with the feet and one like a windmill and another is jumping up and down like a maniac. And the other two . . . devil knows what they're doing. And then they all stop. So! So!!"

"Greg, we're not doing it right. We got to get up close. We've got to watch what they're doing from where we can see the details."

Powell broke a bitter silence, "Yeah, and wait for something to go wrong with only two days to go."

"Is it any better watching from here?"

"It's more comfortable."

"Ah— But there's something you can do there that you can't do here."

"What's that?"

"You can make them stop—at whatever time you choose—and while you're prepared and watching to see what goes wrong."

Powell startled into alertness, "Howzzat?"

"Well, figure it out yourself. You're the brains *you* say. Ask yourself some questions. When does DV-5 go out of whack? When did that 'finger' say he did? When a cave-in threatened, or actually occurred, when delicately-measured explosives were being laid down, when a difficult seam was hit."

"In other words, during emergencies," Powell was excited.

"Right! When *did* you expect it to happen! It's the personal initiative factor that's giving us the trouble. And it's just during emergencies in the absence of a human being that personal initiative is most strained. Now what is the logical deduction? How can we create our own stoppage when and where we want it?" He paused triumphantly—he was beginning to enjoy his role—and answered his own question to forestall the obvious answer on Powell's tongue. *"By creating our own emergency."*

Powell said, "Mike—you're right."

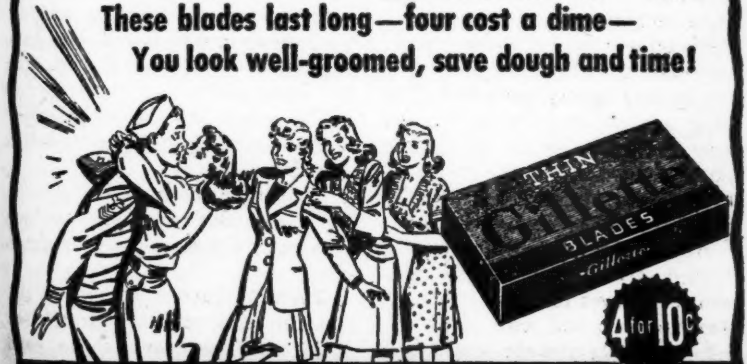
"Thanks, pal. I knew I'd do it some day."

"All right, and skip the sarcasm. We'll save it for Earth, and preserve it in jars for future long, cold winters. Meanwhile, what emergency can we create?"

"We could flood the mines, if this weren't an airless asteroid."

"A witticism, no doubt," said

You're sure in line for shaving joy
When you use Thin Gillettes, my boy!
These blades last long—four cost a dime—
You look well-groomed, save dough and time!



Produced By The Maker Of The Famous Gillette Blue Blade

Powell. "Really, Mike, you'll incapacitate me with laughter. What about a mild cave-in."

Donovan pursed his lips and said, "O. K. by me."

"Good. Let's get started."

Powell felt uncommonly like a conspirator as he wound his way over the craggy landscape. His sub-gravity walk teetered across the broken ground, kicking rocks to right and left under his weight in noiseless puffs of gray dust. Mentally, though, it was the cautious crawl of the plotter.

He said, "Do you know where they are?"

"I think so, Greg."

"All right," Powell said gloomily, "but if any 'finger' gets within twenty feet of us, we'll be sensed whether we're in the line of sight or not. I hope you know that."

"When I need an elementary course in robotics, I'll file an application with you formally, and in triplicate. Down through here."

They were in the tunnels now; even the starlight was gone. The two hugged the walls, flashes flickering out the way in intermittent bursts. Powell felt for the security of his detonator.

"Do you know this tunnel, Mike?"

"Not so good. It's a new one. I think I can make it out from what I saw in the visiplate, though—"

Interminable minutes passed, and then Mike said:

"Feel that!"

There was a slight vibration thrumming the wall against the fingers of Powell's metal-incased hand. There was no sound, naturally.

"Blasting! We're pretty close."

"Keep your eyes open," said Powell.

Donovan nodded impatiently.

It was upon them and gone before they could seize themselves—just a bronze glint across the field of vision. They clung together in silence.

Powell whispered, "Think it sensed us?"

"Hope not. But we'd better flank them. Take the first side tunnel to the right."

"Suppose we miss them altogether?"

"Well what do you want to do, go back?" Donovan grunted fiercely. "They're within a quarter of a mile. I was watching them through the visiplate, wasn't I? And we've got two days—"

"Oh, shut up. You're wasting your oxygen. Is this a side passage here?" The flash flicked. "It is. Let's go."

The vibration was considerably more marked and the ground below shuddered uneasily.

"This is good," said Donovan, "if it doesn't give out on us, though." He flung his light ahead anxiously.

They could touch the roof of the tunnel with a half-upstretched hand, and the bracings had been newly placed.

Donovan hesitated, "Dead end.

Let's go back."

"No. Hold on." Powell squeezed clumsily past. "Is that light ahead?"

"Light? I don't see any. Where would there be light down here?"

"Robot light." He was scrambling up a gentle incline on hands and knees. His voice was hoarse and anxious in Donovan's ears. "Hey, Mike, come up here."

There *was* light. Donovan crawled up and over Powell's outstretched legs. "An opening?"

"Yes. They must be working into this tunnel from the other side now—I think."

Donovan felt the ragged edges of the opening that looked out into what the cautious flashlight showed to be a larger and obviously main-stem tunnel. The hole was too small for a man to go through, almost too small for two men to look through simultaneously.

"There's nothing there," said Donovan.

"Well, not now. But there must have been a second ago or we wouldn't have seen light. Watch out!"

The walls rolled about them and they felt the impact. A fine dust showered down. Powell lifted a cautious head and looked again. "All right, Mike. They're there."

The glittering robots clustered fifty feet down the main stem. Metal arms labored mightily at the rubbish heap brought down by the last blast.

Donovan urged eagerly, "Don't waste time. It won't be long be-

Are You Ready for POST WAR COMPETITION?

When peace comes, most of us will face some real problems. Millions of men will come out of the army and navy to seek civilian jobs; great industries will have to convert back; new industries will spring up to supply new wants and habits. Many wartime jobs will vanish, others will shift in nature and emphasis, new jobs will be open.

It will be a time of strain and opportunity. Competition will be sharper—mediocrity will suffer and ability rise to the top.

The far-seeing man and woman will prepare for this. He will increase his knowledge and skill now to safeguard what he has and to be ready for the new opportunities.

If you are that man or woman, we invite your investigation of LaSalle spare time training. Choose the field that looks best to you after the war and ask us for our free 48-page booklet describing the requirements and opportunities in that field and telling about our home study training.

LASALLE EXTENSION UNIVERSITY

A Correspondence Institution

Dept. 265-R **Chicago, Ill.**

I want to know how I can prepare myself for the post-war opportunities. Please send me your free booklet on the field I have checked below.

☐Foremanship
☐Bookkeeping
☐Traffic Management
☐Law: LL.B. Degree
☐Business English
☐Industrial Management
☐Accounting
☐Executive Management
☐Salesmanship
☐Business Correspondence
☐Stenotypy

Name..............................Age.....

Present Position..............................

Address..............................

fore they get through, and the next blast may get *us*."

"For Pete's sake, don't rush me." Powell unlimbered the detonator, and his eyes searched anxiously across the dusky background where the only light was robot light and it was impossible to tell a projecting boulder from a shadow.

"There's a spot in the roof, see it, almost over them. The last blast didn't quite get it. If you can get it at the base, half the roof will cave in."

Powell followed the dim finger, "Check! Now fasten your eye on the robots and pray they don't move too far from that part of the tunnel. They're my light sources. Are all seven there?"

Donovan counted, "All seven."

"Well, then, watch them. Watch every motion!"

His detonator was lifted and remained poised while Donovan watched and cursed and blinked the sweat out of his eye.

It flashed!

There was a jar, a series of hard vibrations, and then a jarring thump that threw Powell heavily against Donovan.

Donovan yowled, "Greg, you threw me off. I didn't see a thing."

Powell stared about wildly, "Where are they?"

Donovan fell into a stupid silence. There was no sign of the robots. It was as dark as the depths of the River Styx.

"Think we buried them?" quavered Donovan.

"Let's get down there. Don't ask me what I think." Powell crawled backwards at tumbling speed.

"Mike!"

Donovan paused in the act of following, "What's wrong now?"

"Hold on!" Powell's breathing was rough and irregular in Donovan's ears. "Mike! Do you hear me, Mike?"

"I'm right here. What is it?"

"We're blocked in. It wasn't the ceiling coming down fifty feet away that knocked us over. It was our own ceiling. The shock's tumbled it!"

"What!" Donovan scrambled up against a hard barrier. "Turn on the flash."

Powell did so. At no point, was there room for a rabbit to squeeze through.

Donovan said softly, "Well, what do you know?"

They wasted a few moments and some muscular power in an effort to move the blocking barrier. Powell varied this by wrenching at the edges of the original hole. Then he sat down.

"You know, Mike," he said, "we've really messed this up. We're no nearer finding out what's wrong with Dave. It was a good idea but it blew up in our face."

Donovan's glance was bitter with an intensity totally wasted on the darkness, "I hate to disturb you, old man, but quite apart from what we know or don't know of Dave, we're slightly trapped. If we don't get loose, fella, we're going to die.

D—I—E—, die. How much oxygen have we anyway? Not more than six hours."

"I've thought of that." Powell's fingers went up to his long-suffering mustache and clanged uselessly against the transparent visor. "Of course, we could get Dave to dig us out easily in that time, except that our precious emergency must have thrown him off, and his radio circuit is out."

"And isn't *that* nice."

Donovan edged up to the opening and managed to get his metal-incased head out. It was an extremely tight fit.

"Hey, Greg!"

"What?"

"Suppose we get Dave within twenty feet. He'll snap to normal. That'll save us."

"Sure, but where is he?"

"Down the corridor—way down. For Pete's sake, stop pulling before you drag my head out of its socket. I'll give you your chance to look."

Powell maneuvered his head outside, "We did it all right. Look at those saps. That must be a ballet they're doing."

"Never mind the side remarks. Are they getting any closer?"

"Can't tell yet. They're too far away. Give me a chance. Pass me my flash, will you? I'll try to attract their attention that way."

He gave up after two minutes, "Not a chance! They must be blind. Uh-oh, they're starting towards us. What do you know?"

Donovan said, "Hey, let me see!"

Watch MIDWEST RADIO after Victory
FOR ADS LIKE THIS...
SAVE UP TO 50%
on this new MIDWEST Radio
FACTORY-TO-YOU
FREQUENCY MODULATION
MIDWEST'S FAMOUS 30 DAYS HOME TRIAL
PUT THIS CHASSIS IN YOUR PRESENT CABINET
MIDWEST RADIO CORPORATION
DEPT.
CINCINNATI, OHIO

TO ALL its old friends and customers . . . and to the rising new generation, too, Midwest Radio Corporation makes this pledge: Once Victory has been won . . . once the needs of our Armed Forces for radio and electronic instruments has been met and production for civilian demands is approved . . . Midwest will again be back with its world-famous Factory-To-You plan for buying highest quality radio and electronic equipment — at savings up to 50%.

SEND FOR
FREE
CALENDAR
Send us 10c in stamps or coin for a War Savings Stamp and receive in addition an attractive 4-color calendar with International Time Calculator absolutely FREE.

MIDWEST RADIO CORPORATION
DEPT. 42-B CINCINNATI, OHIO

There was a silent scuffle. Powell said, *"All right!"* and Donovan got his head out.

They *were* approaching. Dave was high-stepping the way in front and the six "fingers" were a weaving chorus-line behind him.

Donovan marveled, "What are they *doing?* That's what I want to know. It looks like the Virginia reel—and Dave's a major-domo, or I never saw one."

"Oh, leave me alone with your descriptions," grumbled Powell. "How near are they?"

"Within fifty feet and coming this way. We'll be out in fifteen min— Uh—huh—HUH—*HEY-Y!"*

"What's going on?" It took Powell several seconds to recover from his stunned astonishment at Donovan's vocal gyrations. "Come on, give me a chance at that hole. Don't be a hog about it."

He fought his way upwards, but Donovan kicked wildly, "They did an about-face, Greg. They're leaving. Dave! Hey, *Da-a-ave!"*

Powell shrieked, "What's the use of that, you fool. Sound won't carry."

"Well, then," panted Donovan, "kick the walls, slam them, get some vibration started. We've got to attract their attention somehow, Greg, or we're through." He pounded like a madman.

Powell shook him, "Wait, Mike, wait. Listen, I've got an idea. Jumping Jupiter, this is a fine time to get around to the simple solutions. Mike!"

"What do you want?" Donovan pulled his head in.

"Let me in there fast before they get out of range."

"Out of range! What are you going to do? *Hey,* what are you going to do with that detonator?" He grabbed Powell's arm.

Powell shook off the grip violently, "I'm going to do a little shooting."

"Why?"

"That's for later. Let's see if it works first. If it doesn't, then — Get out of the way and let me shoot!"

The robots were flickers, small and getting smaller, in the distance. Powell lined up the sights tensely, and pulled the trigger three times. He lowered the guns and peered anxiously. One of the subsidiaries was down! There were only six gleaming figures now.

Powell called into his transmitter uncertainly. "Dave!"

A pause, then the answer sounded to both men, "Boss? Where are you? My third subsidiary has had his chest blown in. He's out of commission."

"Never mind your subsidiary," said Powell. "We're trapped in a cave-in where you were blasting. Can you see our flashlight?"

"Sure. We'll be right there."

Powell sat back and relaxed, "That, my fran', is that."

Donovan said very softly, with tears in his voice, "All right, Greg. You win. I beat my forehead against the ground before your feet. Now *don't* feed me any bull. Just tell me quietly what it's all about."

"Easy. It's just that all through we missed the obvious—as usual. We knew it was the personal initiative circuit, and that it always happened during emergencies, but we kept looking for a specific order as the cause. Why should it be *an* order?"

"Why not?"

"Well, look. Why not a *type* of order. What type of order requires the most initiative? What type of order would occur almost always only in an emergency?"

"Don't ask me, Greg. Tell me!"

"I'm doing it! It's the *six-way* order. Under all ordinary conditions, one or more of the 'fingers' would be doing routine tasks requiring no close supervision—in the sort of offhand way, our bodies handle the routine walking motions. But in an emergency, all six subsidiaries must be mobilized immediately and simultaneously. Dave must handle six robots at a time and something gives. The rest was easy. Any decrease in initiative required, such as the arrival of humans, snaps him back. So I destroyed one of the robots. When I did, he was transmitting only *five-way* orders. Initiative decreases—he's normal."

"How did you get all that?" demanded Donovan.

"Just logical guessing. I tried it and it worked."

The robot's voice was in their ears again, "Here I am. Can you

SHOP
METHOD
HOME
TRAINING

Get into
RADIO ELECTRONICS TELEVISION *now!*

Your opportunity is here. Radio technicians needed everywhere — afield in action and at home in industry. Get into Radionics now. National School offers tested home training method—an actual extension of training you would receive if attending school in person.

SHOP METHOD, HOME TRAINING

For 38 years, National Schools has trained ambitious men for Top Pay Trades. The same technique, the identical shop methods that are so successful in training Radio men at the School, are now available to you by National's Plan of Home Training.

COMMAND GOOD JOBS as Radio Technician in Uncle Sam's forces or in civilian industries. National's actual shop practice methods qualify you. Investigate!

FREE SAMPLE LESSON!
Act Now. You'll be amazed when you receive our Free Trial Lesson and full details. No obligation; no cost. Investigate. **Earn while learning.**

2 BOOKS FREE

NATIONAL SCHOOLS
Los Angeles, Calif.
Est. 1905

MAIL COUPON FOR FREE LESSON & BOOK

National Schools, Dept. 1-SSR
4000 S. Figueroa, Los Angeles 37, Calif.
(Mail in envelope or paste on penny postal.)

Mail me FREE, without obligation, one Lesson and Opportunity Book, with full details about how I CAN become a RADIO Technician.

NAME ________________ AGE ____

ADDRESS ________________

CITY ________________ STATE ____

hold out half an hour?"

"Easy!" said Powell. Then, to Donovan, he continued, "And now the job should be simple. We'll go through the circuits, and check off each part that gets an extra workout in a six-way order as against a five-way. How big a field does that leave us?"

Donovan considered, "Not much, I *think*. If Dave is like the preliminary model we saw back at the factory, there's a special co-ordinating circuit that would be the only section involved." He cheered up suddenly and amazingly, "Say, that wouldn't be bad at *all*. There's nothing to that."

"All right. You think it over, and we'll check the blueprints when we get back. And now, till Dave reaches us, I'm relaxing."

"Hey, wait! Just tell me one thing. What were those queer shifting marches, those funny dance steps, that the robots went through every time they went screwy."

"That? I don't know. But I've got a notion. Remember, those subsidiaries were Dave's 'fingers'. We were always saying that, you know. Well, it's my idea that in all these interludes, whenever Dave became a psychiatric case, he went off into a moronic maze, spending his time *twiddling his fingers*."

THE END.

THE ANALYTICAL LABORATORY

Gentlemen, you have me puzzled, deadlocked and stalemated. Apparently you are intellectually honest, but confused, or Anthony Boucher double-crossed you. The net effect of the letters, as far as I could make out, was that you wanted Astounding reserved for science-fiction and only science-fiction—no fantasy. That is necessarily a sort of over-all feeling derived from the general effect of what was said. Some said "With *Unknown* discontinued, let us have some fantasy in Astounding." That's reasonable, but unfair. I can't justly put fantasy in Astounding unless it's wanted for its own sake by the majority of the readers. But so many said "I don't want fantasy in Astounding, even if it's as well written as Boucher's story—" that the mathematical results of the votes came out:

December Astounding

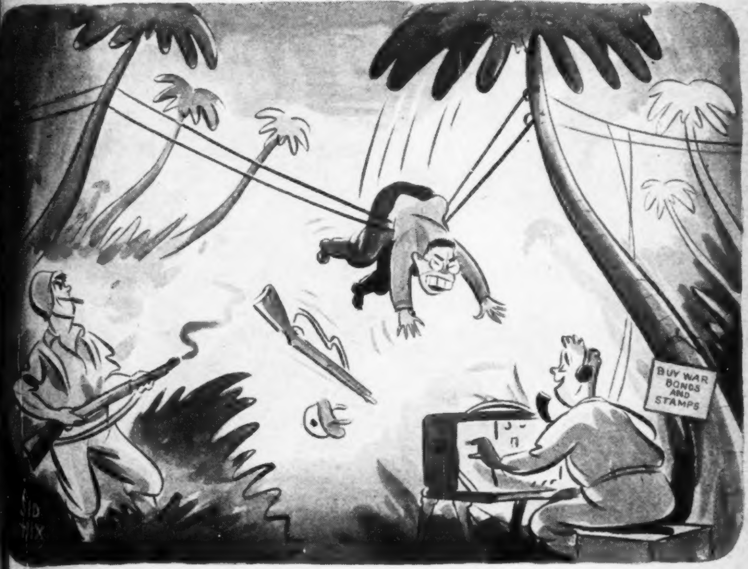
Place	Story	Author	Points
1.	The Debt	E. Mayne Hull	2.1
2.	We Print The Truth	Anthony Boucher	2.55
3.	The Iron Standard	Lewis Padgett	3.25
4.	Lost Art	George O. Smith	3.36
5.	Fricassee in Four Dimensions	P. Schuyler Miller	3.40

Which put "We Print The Truth" in second place.

The answer would seem to be that fantasy is all right if well, coherently, and thoughtfully written. I'll see what remarks this discussion brings, too—

THE EDITOR.

LIGHTER MOMENTS with fresh Eveready Batteries

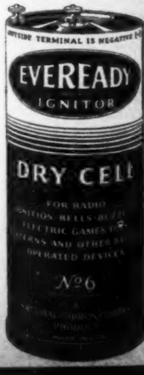

BUY WAR BONDS AND STAMPS
SID HIX

ne Moment, Please . . . There's Someone on the Wire!"

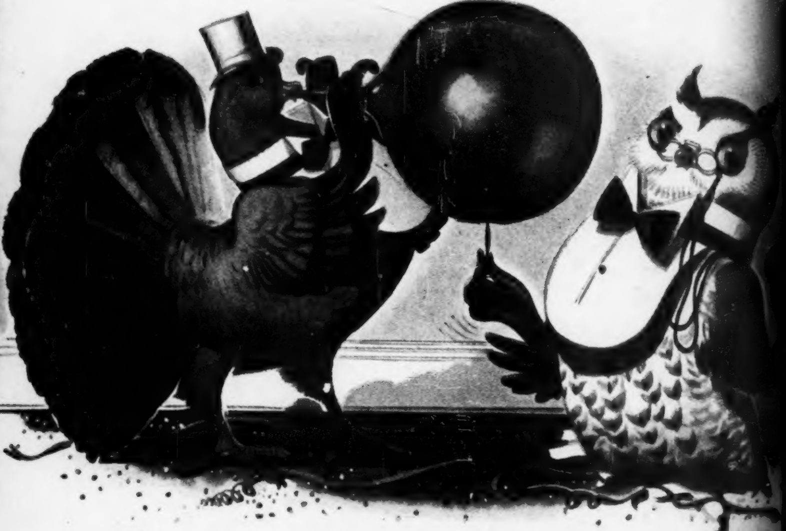
IGHT NOW the armed forces are using much of our pro-
ction of "Eveready" No. 6 Dry Cells for field telephone
its. That limits the civilian supply, so please use yours
efully.

you buying all the
r Bonds you can as
you can?

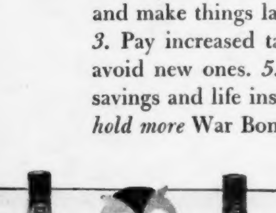
EVEREADY
TRADE-MARK


OUTSIDE TERMINAL IS NEGATIVE (-)
EVEREADY
IGNITOR
DRY CELL
FOR RADIO
IGNITION BELLS BUZZ
ELECTRIC GAMES
LANTERNS AND OTHER
OPERATED DEVICES
No 6

Seven things you can do to stop Inflatio



Keep prices down! For Victory and your own post-war security do these seven things: *1.* Buy only what you need and make things last. *2.* Pay no more than ceiling prices. *3.* Pay increased taxes willingly. *4.* Pay off old debts and avoid new ones. *5.* Live within present income. *6.* Build up savings and life insurance for the future. *7.* Buy and *hold more* War Bonds.



Clear-heads choose Calvert

Sponsored by the makers of

Calvert

The whiskey with the "Happy Blendin